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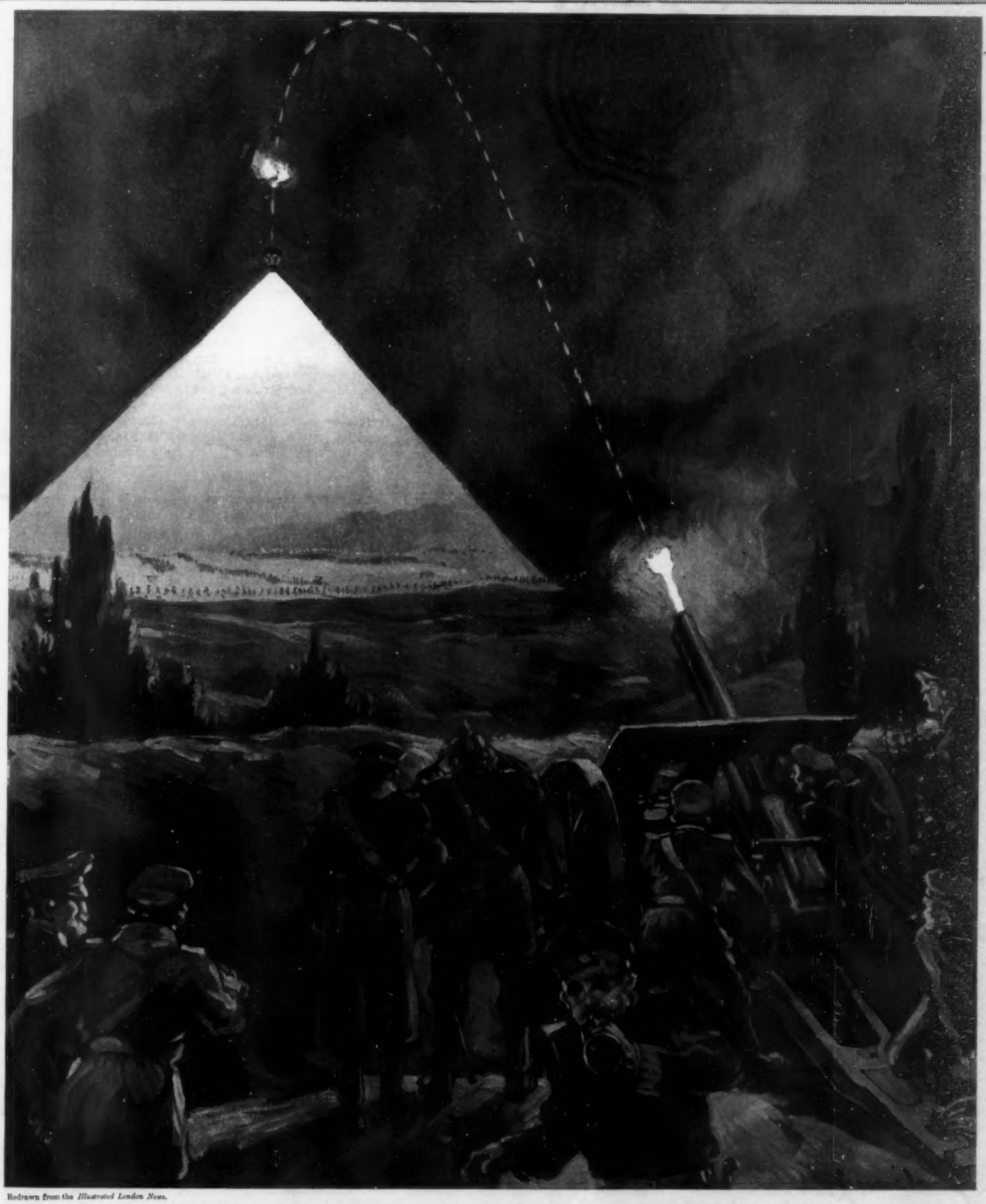

Redrawn from the *Illustrated London News.*

The famous Krupp firm is said to have made a light-giving shell. The illuminating-shell contains a bursting-charge, which, at the allotted moment, frees the parachute folded in the base of the shell. The light-giving material is automatically lighted and remains active for several minutes. The trajectory of the shell is marked with a dotted line.

AN ILLUMINATING-SHELL FALLING AND DISCLOSING AN ATTACK.—[See page 282.]

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

A Destroyer of Destroyers

AT the close of the Russo-Japanese War, the chief engineer of a Russian torpedo-boat destroyer, who had passed through twelve months of active service in the defense of Port Arthur, called at this office, and in discussing the experience of the Russian destroyer fleet during the siege, stated his belief that the larger and faster destroyers of the future would become so swift, able and powerful, as to call for the design of some special type of vessel to deal with them.

That conversation is called to the writer's mind by a dispatch from one of the British dockyards, describing a new type of cruiser which has been designated by the First Lord of the Admiralty as a "destroyer of destroyers." The vessel is described as being of 3,500 tons displacement and capable of a continuous sea speed of thirty knots. She is credited with a belt of five-inch armor and a battery of 4.7- or 6-inch rapid-fire guns. It is stated that eight of these ships are at present under construction for the British navy.

If the vessels are being built for this specified duty, their speed, battery, and protective quality are none too large for the duty assigned to them. The modern destroyer has graduated from the "boat" into the "ship." That it is eminently seaworthy was proved in the winter of last year, when our destroyer fleet, on its way to Cuba, was subjected for several days to one of the fiercest storms ever experienced in the western North Atlantic—and these vessels, be it remembered, were of much lighter construction than those which are now being built for our navy.

The latest destroyers, moreover, are capable of being driven at full speed under unbelievably severe conditions; and any vessel which is designed for the special work of overtaking and sinking such vessels must herself be a large, fast and very staunch ship. Moreover, it is perfectly logical that the destroyer of destroyers should be an armored vessel; otherwise she would be at the mercy of the quite formidable armament which is now mounted on the destroyers. The one-, three-, and six-pounders of the days of Dewey and Sampson have given place to high-velocity, long-range, rapid firers of four-inch caliber; and the ship that undertakes to hunt down a quarry armed with such pieces as this must needs carry protective armor of high quality and reasonable thickness.

The Interstate Commerce Commission and Safety on Railroads

A BILL is to be introduced in Congress giving the Interstate Commerce Commission full power to regulate the roadbed, equipment and actual operating conditions of the railroads of the United States so far as they are related to the safety of the traveling public. The bill is based upon the suggestions of the officials of the Commission. Its object will be to compel the railroads to maintain their equipment and roadbeds at a sufficient standard of excellence, and to run their trains only at such speeds as are justified by the existing physical condition of the track, equipment, and signal system.

As matters now stand, the Commission is empowered to investigate all railroad wrecks and make such suggestions for the improvement of the tracks and equipment and the methods of operation as it may deem necessary. Beyond this the Commission cannot go; its recommendations are not obligatory upon the railroads. It contends that the railroads have ignored its findings, and in the matter of protecting the traveling public, it finds itself in practically the same predicament with which it was confronted in the matter of rate making, before it obtained adequate Federal authority to enforce its rulings.

Now it is certain that a bill which seeks to confer upon the Commission such far-reaching powers as this will be met with the strongest opposition, mainly on the ground that it places in the hands of a few men the power to impose upon the railroads expenditures for roadbed and equipment which might prove to be altogether ruinous.

The importance of the bill and the grave consequences which would follow from a too zealous exercise of the powers which it will confer, are not be denied; as will be seen from the fact that if the Commission, exercising its enlarged power to the full extent, should order the railroads at once to replace all wooden cars by cars of steel and to introduce a block signal system on the whole of their tracks, it would mean the immediate expenditure of something like one billion dollars. That the Commission would make any such abuse of its powers, or that it would exercise them in any degree that would be harmful to the interests of the railroads, is improbable. On the contrary, the record of the work done by this excellent body in the matter of interstate commerce and rate adjustment gives every reason to believe that, if they are given the power to enforce their suggstions made on behalf of public safety, they will do so in a manner which strikes a just and fair mean between the interests of the railroads and those of the public which they serve.

The fundamental principle of the Interstate Commerce Act of 1887 was that rates, regulations and practices affecting interstate transportation should be reasonable and just and devoid of an undue and unreasonable discrimination. Subsequent legislation strengthened the hands of the Commission by giving it the power to enforce its suggestions and impose penalties. In 1906, during a congressional investigation into the relations of carriers to the coal and oil business, an act was passed increasing the power of the Commission to regulate interstate commerce and conferring upon it authority to prescribe for the future just and reasonable rates, regulations and practices. During the period from 1887 to 1906 there were filed with the Commission 878 claims, and between the passage of the Hepburn Act of 1906 and the year 1911, 3,135 complaints were filed, and 2,000 decisions were rendered.

We commend to our readers an article written by Judge Judson C. Clements, then chairman of the Interstate Commerce Commission, which appeared in the SCIENTIFIC AMERICAN of June 17th, 1911. The facts above given are taken from that article, in which the Judge went on to say that, up to that time, 239 criminal prosecutions had been instituted for violations of the act, and about three quarters of a million dollars in fines had been collected from guilty shippers and carriers. Reparations, aggregating over $2,000,000, had been ordered in formal contested cases, and over one million dollars had been allowed upon the application of carriers on stipulated facts and suitable inquiries.

The passage of the Interstate Commerce Act of 1887 was strenuously resisted upon many grounds, constitutional and otherwise. "It was alleged," says Judge Clements, "to be radical, revolutionary, un-American and of unjustifiable interference with the freedom of contract and with ancient commercial usages." Nevertheless, we doubt if to-day anyone, either inside or outside of railroad circles, will deny that the work of the Interstate Commerce Commission has been of inestimable benefit both to the railroads and the public at large.

It is scarcely necessary to state that the movement to strengthen the hands of the Commission is prompted by the experience that body has had during the past two or three years with the New Haven Railroad, in its endeavor to secure certain physical changes in the roadbed and equipment which, in the opinion of the Commission, were necessary to prevent such fatal accidents as have made that road notorious. It is well understood and, indeed, the Commission in its recent report has made it clear, that if the railroad company had made certain improvements, both in the maintenance and operation of its roads, some of the later accidents, in all probability, would not have occurred. The Commission suggested these changes to the company, and there its power ceased. It lacked the Federal authority to enforce its findings. As matters now stand the Commission can merely investigate and suggest; if the present bill is passed the Commission will be able to investigate, draw its conclusions and enforce its mandates.

The excellent record of the Commission in its handling of the rate situation is an answer to the objection which is sure to be raised, that the passage of the bill may subject the railroads to the imposition of obligations in the way of wholesale betterments and improvements which will be ruinous to their prosperity. There is nothing to justify such a fear. Federal control of the physical equipment of railroads, so far as it has been exercised in the past, has been marked by forbearance and just discrimination. This was shown in the matter of the enforced equipment of trains with airbrakes and automatic couplers. Whenever a railroad proved to the Commission that its financial condition was such that it required more time for carrying out the Commission's mandate, the time was allowed; and we have every reason to believe that the same spirit of fairness will govern the Commission in the matter of roadbed and rolling stock and the proper adjustment thereto of the speed of trains.

Bomb-dropping in the Balkans

IT is even yet too early to give a detailed or critical account of the part that bomb-dropping played in the war against Turkey. Enough, however, has been learned from the reliable discussions which have appeared in the technical press to confirm the conclusions reached long ago by military men.

The question of bomb-dropping must be viewed from two aspects: What is the effect of the dropped bomb? Can the bomb-dropping aviator fly sufficiently high to escape an enemy's bullets and still drop explosives accurately?

Experience in the Balkan campaign seems to show that the moral effect of an exploding bomb that falls from the sky is greater than its actual destructive effect; also that a height of at least 4,000 feet must be maintained if the bomb-dropper is to perform his task in safety.

Thus on December 15th, 1912, Moutoussis, on a flight from Treveza to Janina, threw bombs from a height of 5,000 feet and created a panic; but the fabric of his wings was punctured by hostile bullets, so that he made his escape not without difficulty. Another Greek, Capt. Bares, was reached by bullets even at a height of 6,500 feet, but he too made good his escape. On December 22nd, 1912, Moutoussis threw bombs from a height of 6,200 feet at Janina with good effect; but again his machine was hit by bullets, without being crippled. If machines can be struck at such heights, the aviator escapes only by the luckiest chance.

A responsible witness, the English flier Hedley, who was with the Bulgarians before Adrianople, testifies that one of the many minarets of a mosque was destroyed by an aeroplane bomb dropped from his machine. This speaks well for the destructive power of the light bombs carried by aeroplanes. On the other hand, the hit was a stroke of luck. It was not even noticed by the pilot himself, and was made known to him only by other pilots and by Turkish prisoners.

If the Balkan experiences teach anything, they teach that the importance of aeroplane bombs lies in their moral effect—in the impression created that the machine in the sky is a real source of danger. It is conceivable that in a kind of hand-to-hand fight (the machine hugging the ground and depending on speed for its safety) bombs might become very formidable. But at great heights the machine gun is superior to the bomb.

There are several obvious reasons for this superiority of the gun over the bomb. It is clear that if a bomb is to be dropped accurately, the pilot must fly almost directly over the target and expose himself to the long point-blank range of high angle infantry fire. If the marksmen are good he may be brought down. But if a machine gun is mounted in the aeroplane and the aviator relies upon it instead of upon bombs, he may keep well to one side of his target. Circling around he will quickly get the range. What is more, he has all the advantage of noting the effect of his bullets from a great elevation, an advantage much coveted by artillerists and infantry officers who experience the greatest difficulty in seeing exactly where their missiles strike.

That the day is not very far distant when machine guns will be mounted on aeroplanes was clearly indicated at the recent Paris and London expositions. On both of these occasions very large biplanes were exhibited with machine guns mounted in very advantageous positions. The weapons were carried in the foremost part of the biplane in the nose of the pointed car, so that they could cover the entire field in front of them. In that position, however, they could not be used at all against an aerial pursuer.

Apart from the greater accuracy which can probably be attained with machine gun fire, bombs may become a source of danger to the machine in which they are carried. If the fire of an infantry regiment or two be concentrated on an aeroplane there is a chance that the explosive freight may be struck, with disastrous results. There seems to have been some inkling of this danger in the Balkans, for French pilots before Adrianople refused to take bombs aboard.

Engineering

Searchlight Projectiles.—Some suggestive experiments have been made on German warships with lighted projectiles, which it is thought may take the place of the electric searchlight. The projectile, which is filled with calcium carbide, is fired from a cannon, and since it is lighter than water, after striking, it comes to the surface. During its immersion, water is automatically admitted, and produces acetylene gas, which burns with an illumination equal to that of three thousand candles. The placing of a few of these around a distant enemy would certainly put him at very serious disadvantage.

The Assouan Dam on the Nile can be called upon to furnish a large amount of hydraulic power for operating an electric plant; it is estimated that it would furnish no less than 150,000 horse-power. During five months in the autumn and winter the water of the Nile accumulates in the dam, and when it overflows the height of the resulting fall and the great volume of water would furnish some 150,000 horse-power. Current could be used for the manufacture from the atmosphere of nitrogenous products for use as fertilizer. This would be of great value to the country, for it is stated that Egypt imported no less than $3,500,000 worth of fertilizers during the last year.

The First Passage of the Panama Lock.—On September 26th the first passage of the locks at Gatun, Panama Canal, was made by a tugboat. The water in Gatun Lake was 65 feet above sea level, or 20 feet below its ultimate level. The upper lock was filled slowly in the forenoon, and in the afternoon the water was admitted to the middle and lower locks. At 4:45 P. M. the level in the lower locks having reached the level of the Atlantic, the gates were swung open and the tug entered, the historic event being heralded by the cheers of the assembled thousands. At 6:45 P. M. the tug passed from the upper lock to Gatun Lake. The test was made slowly and with complete success.

Twelve Years Experience with Automatic Stops.—The automatic stop has had some twelve years of trial under various conditions, with the result that four municipal rapid transit systems have them in satisfactory operation, and three of these, after demonstrating that the stop increases both the safety of travel and the traffic capacity of their systems, have extended their use. The finest performance is that recorded in the New York city subway, where the stop makes it possible to run trains under a headway of one minute and forty-three seconds. The automatic stop is a telltale upon careless or inefficient motormen, since it affords a record of the fact that a signal has been overrun.

Noiseless City Streets.—There is coming into use in Germany a cheap and ready method of asphalting a stone-paved street which is showing good results. The spaces between paving blocks are cleaned out to the depth of about an inch, and then a layer of melted asphalt is flowed over the street surface, the depth of the layer being about one inch. Before it is cooled, sand is sprinkled on and the surface is smoothed. At Frankfort a section of this kind is now laid, and it appears to stand the wear remarkably well. Should the method prove a success in general practice, it will afford an excellent means for deadening the noise of city traffic at a small expense. It is quickly carried out and it need not stop the circulation on narrow streets for any length of time. Moreover, repairs are easily made.

Successful Gasoline Locomotive.—At the Schneider mines in France there are being made trials of a new light locomotive with a 70 horse-power internal combustion engine. A novel feature is the use of naphthaline as fuel, employing a special carbureter. It is claimed that the present locomotive is the best solution of the problem of a small locomotive for use with trains on a narrow-gage railroad. The trials made near Havre showed excellent results as to general working as well as fuel consumption. Advantages over steam locomotives are: rapid starting, no boiler upkeep, suppression of water supply along the road, ease of driving and absence of danger, reduction of dead weight to the least amount, small bulk of fuel on board and absence of smoke and cinders.

The Forty-thousandth Locomotive.—That a firm of builders should have recently completed its forty-thousandth locomotive bears testimony to the magnitude of the locomotive-building industry of this country. The Baldwin Locomotive Company, who have accomplished this feat, built their first locomotive in 1832. The one-thousandth was turned out from the works in 1861; and in 1880, the five-thousandth locomotive appeared. No. 10,000 was built in 1889, and No. 20,000 in 1902. It took only five years for the company to build its next 10,000 locomotives, and the present year sees the completion of the forty-thousandth, a fast passenger "Pacific" type. This locomotive has cylinders 26 inches in diameter by 26 inches stroke, 80-inch driving wheels, 4,525 square feet of heating surface, weighs 189,500 pounds, and has a tractive force of 38,300 pounds. It was built for the Pennsylvania Railroad.

Science

Solvay's Generosity.—Ernest Solvay, discoverer of the soda process that bears his name, celebrated the 50th anniversary of his discovery on the 20th ult. by giving more than $1,000,000 to educational and charitable institutions and to the employees of his firm. The universities of Paris and Nancy each received $100,000.

The F-Rays Do Not Exist.—The discovery that was announced of a new series of rays, the F-rays, has just been contradicted. According to very precise and detailed information published by the *Eclair*, it appears that the results obtained are not at all conclusive. The F-rays appear to be an illusion similar to that of which the scientific world was a victim when the physicist Blondlot, professor at the Faculty of Nancy, professed to have discovered the N-rays.

Fermentation in the Paper Industry.—Among the recent improvements in handling paper making materials is a process for extracting the starch from cotton rags that are used in making linen papers. Practically all cotton cloth has some kind of a filler, and much of this is starch. In clippings from new cloth there is a considerable amount of starch filler. It was the practice formerly to soak the rags in warm water, and then to boil them in an alkali solution. But the effect of the alkali on starch is very slow, as it causes the starch to swell up, so that the solution reaches the inner part of the starch grains only with difficulty. Malt is added in the proper amount to convert the starch into a soluble sugar which readily dissolves out of the fiber of the cloth and leaves it free of the filler. The active principle of the malt is the "enzymes" that attack the starch just as they do in the brewing process, and convert it into a form of sugar that is easily disposed of.

Delavan's Comet.—A telegram received at Harvard Observatory from Capt. J. L. Jayne, of the United States Naval Observatory, gives the following position of Delavan's comet as observed by Burton:

September 27.7204 G.M.T.
R.A. 21h. 50m. 37s.6
Dec. —1 deg. 37 min. 33 sec.

The following position received from Prof. W. W. Campbell, of the Lick Observatory, is from an observation by Prof. Aitken:

September 27.7201 G.M.T.
R.A. 21h. 50m. 38s.5
Dec. —1 deg. 37 min. 36 sec.

A telegram from Prof. A. O. Leuschner, of Berkeley, California, states that Nicholson and Miss Kidder find Delavan's comet identical with Westphal's by interpolation applied to the ephemeris given in *Astronomische Nachrichten* No. 4619. The period is 61.121 years.

The Death of Professor J. R. Eastman.—Prof. John Robie Eastman, the astronomer, died at a private hospital at Franklin, N. H., on September 26th. He was 77 years old. Prof. Eastman was an assistant at the United States Naval Observatory at Washington from 1861 to 1865, and professor of mathematics since then. He was retired for age in July, 1898, with the rank of captain. In June, 1906, he was promoted to the rank of rear admiral. Prof. Eastman was the first president of the Washington Academy of Sciences and was in charge of the meridian circle work at the observatory from 1874 to 1891. He was also in charge of the transit of Venus party at Cedar Keys, Fla., in 1882. Prof. Eastman prepared and edited the Second Washington Star Catalogue, which contains the results of nearly 80,000 observations made at the Naval Observatory, 1866-91. He was the author of "Transit Circle Observations of the Sun, Moon, Planets, and Comets," 1903.

Neujmin's Remarkable Comet.—Neujmin's comet has aroused not a little interest among astronomers. It was discovered on September 6th last, five days after Metcalf's comet. From private sources we learn that the period of 25½ years, calculated by Einarsson and Nicholson, is probably correct and that the object is really a comet, although a very queer one. It was discovered in the Crimea, where the Pulkowa Observatory maintains a station mainly for the observation of asteroids. The object was found on one of their photographic plates and was at first supposed to be an asteroid, as there was no evidence of nebulosity. The discovery of new asteroids is not cabled to America, but the discovery of new comets is so cabled. When notice of the object as an asteroid reached Bergersdorf, near Hamburg, Germany, it was observed visually, and it was decided to be a comet. Then it was that the news first reached America by cable. Viewed in the great telescope of the Yerkes Observatory, the object indeed appears like an asteroid, but it has a very faint nebulous appendage which, to the practised eye, distinguishes it from an asteroid. Hence the object is nearly all nucleus. Were it not for the presence of the inconspicuous tail, the star-like appearance of the object might easily mislead even a practised astronomer into taking it for an asteroid. The comet is barely visible in a five-inch telescope as a small faint haze. The comet by no chance can ever be seen with the naked eye.

Aeronautics

A French-German Air Treaty.—The Luneville incident has resulted in a convention between France and Germany, which provides for the future landings of aircraft in the respective territories of the two countries. In case military aircraft in distress are driven over the territory of the neighboring country, the pilots are to hoist appropriate signals and to descend as soon as possible.

Harnessing the Flying Machine.—Thomas William Carey, of New Orleans, La., has secured a patent. No. 1,070,011, for an aviation apparatus which includes a circular trackway with upper and lower tracks and a flying machine held to the trackway and guyed to prevent irregular movements. Some of the guys extend fore and aft to prevent pitching and others extend transversely to prevent canting or rolling.

Airship Starting Reservoir Acts as a Float.—A patent, No. 1,070,576, has been issued to F. B. Bell, of El Paso, Texas, for a flying machine in which the gas engine is started by air from a reservoir for compressed air and the reservoir is located in the lower part of the machine so it can serve as a pontoon when the machine descends upon water. A series of tanks form the reservoir, and an air compressor driven by the engine compresses air in the tanks.

Moreau Wins the Bonnet Prize.—On September 24th, Moreau with his self-righting aeroplane won the Bonnet prize by flying half an hour without touching the levers. Lieut. Lafon accompanied him as a passenger to verify the performance. It is said that a strong wind was blowing at the time, that the monoplane rolled and pitched, but invariably returned automatically on a level keel. The SCIENTIFIC AMERICAN has fully described and illustrated the Moreau machine.

The New German Zeppelin "L. II."—The Zeppelin works have completed the "L. II." She is said to be a far safer type than the ill-fated "L. I." Her length is 541 feet; in other words, she is 10 feet longer than the "L. I." Her breadth is 49 feet. There are three cars, two of which contain the engines, while the third is intended for the officer in charge. The total engine power delivered by the four motors of the ship is 800 horse-power. It is hoped to attain a speed of no less than 75 miles an hour with this vessel.

A Wind Deflector for Wings.—M. Constantin, a well known designer abroad, has applied the principle of the "saute vent" or wind deflector to the wings of an aeroplane, and it is said that surprising results have been obtained. The deflector comprises plates placed forward of the wing and curving upward toward the rear in such a manner that the wind is deflected up and away from the wing. Thus the wings of the aeroplane are protected from the direct force of the wind on their upper surfaces. The object of the device is to increase the rarefaction of air above the wing, thereby increasing the lift.

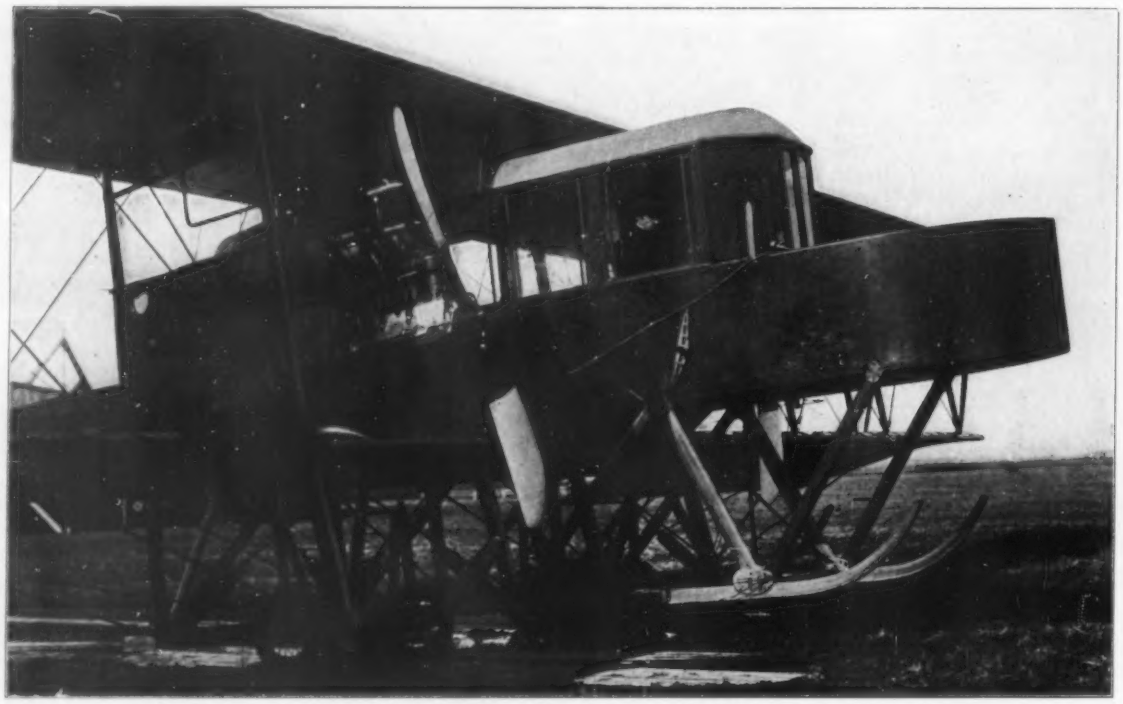
A New Airship Type.—The airship "Veeh I," which made its first ascent on July 8th, last, at Düsseldorf, embodies some new principles in its construction. The attempt has been made to combine the merits of rigid and non-rigid systems. A steel tube framing covered with fabric runs from the bow to the stern beneath the gas bag and is of such proportions that it contains the cabin and serves as a passageway. This keel frame, for such it is, houses two 130 horse-power Mercedes motors, the pilot's cabin and the passengers' cabin. The vessel is driven by four wooden propellers carried on outriggers. A large vertical rudder and a horizontal rudder are mounted at the stern. The entire keel frame can be very quickly detached from the envelop and separately transported. The vessel is 80 meters long, 30 meters in diameter and has a capacity of 8,000 cubic meters of gas.

The Gordon Bennett Race.—The race for the Gordon Bennett trophy was won this year by Maurice Prevost. Because there was only one foreign competitor, a Belgian named Crombez, the race was really a contest among Frenchmen, and hence aroused but little interest. For all that it was a remarkable competition, chiefly because of the record-breaking speeds attained. Maurice Prevost covered the course of 124.77 miles in 59 minutes 45⅘ seconds. His average speed was more than 125 miles an hour which is more than two miles a minute. That is the fastest speed yet attained in a flying machine. There were two other French competitors besides Prevost, namely, Eugene Gilbert and Emile Vedrines. Vedrines also broke all speed records, but he finished nevertheless 1 minute 5⅕ seconds behind Prevost. Crombez, the Belgian, finished last, his time being 1 hour 9 minutes and 52 seconds. There was not much variety in machines. Prevost, Gilbert and Crombez flew Deperdussins, and Vedrines a Ponnier. Prevost cut down the surface of his wings until they were only 96 feet square. There can be no doubt that this helped him to make speed, but it also made landing dangerous. He flew at midday and kept rather low, rarely exceeding an elevation of 35 feet.

The Biggest Flying Machine in the World

The Remarkable Biplane of Sikorsky

IN a recent number of the SCIENTIFIC AMERICAN attention was called to the gigantic biplane which was designed by Sjkorsky and which flew for just over an hour with seven passengers at St. Petersburg on August 1st.



This huge flying machine recently flew for just over an hour with seven passengers.

According to a detailed description published in the *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, Sjkorsky's machine follows the general lines of the well known biplane of H. Farman. Sjkorsky's is the biggest flying machine that has ever been constructed and flown. It has a span of 28 meters (91.86 feet), and a length of 20 meters (65.6 feet). The supporting surfaces have an area of 120 square meters (143.52 square yards). The lower plane has a span of about 5½ meters (18.04 feet) less than the upper plane.

The machine is driven by four motors of 100 horse-power each, mounted on the lower plane. Each motor drives directly a propeller of 2.6 meters (8.5 feet) diameter. The propellers are tractor screws, rotating in front of the supporting surfaces and the motors, so that a cooling blast of air is directed against the motors and radiators.

The starting and alighting gear is very stoutly built. There are four landing skids—two long ones in the middle beneath the boat body, and a short one on each side beneath the lower plane. The wheels on which the machine is carried are arranged in pairs on common axles between the skids on each side. The wheels are provided with very heavy pneumatic tires inasmuch as the machine weighs over 2,700 kilogrammes (5,952 pounds) unloaded and about 3,200 kilogrammes (7,054 pounds) with passengers, fuel, etc. The axles of the two pairs of wheels are secured to short skids which are provided with two brackets to the upper ends of which two rubber straps are fastened, thus providing an elastic connection with the main skids. The short skids are connected on either side by cables with the wheels, and the wheels in turn are fastened by rubber straps to the skids so that they may yield laterally.

The tail consists of a single surface and elevator combined, above which two vertical rudders are arranged. The supporting surfaces are provided with flaps or ailerons. In addition two vertical surfaces, one on each side, are mounted below the upper surfaces about six meters (19.68 feet) from the central axis. These surfaces measure about 1.6 meters (5.24 feet) square.

The pilots and passengers are comfortably housed in a cabin, so that they are well protected from the wind and weather. The lower part and the floor of the cabin are covered with sheet steel, as well as the front portion of the boat body. Celluloid windows are provided. The seats are arranged in three rows behind one another. The two front seats, between which is a passageway, are occupied by the pilots. In front of each pilot is a control lever and a steering wheel to operate the elevating rudder and ailerons respectively, and a foot lever to control the vertical rudders.

Each motor drives a tachometer through the medium of a flexible shaft. The four tachometers are mounted in front of the pilots' seats. Since it is difficult to keep all four motors running at the same speed, Sjkorsky intends to use a connecting shaft, which will be thrown into engagement with the motor shafts by means of beveled gears.

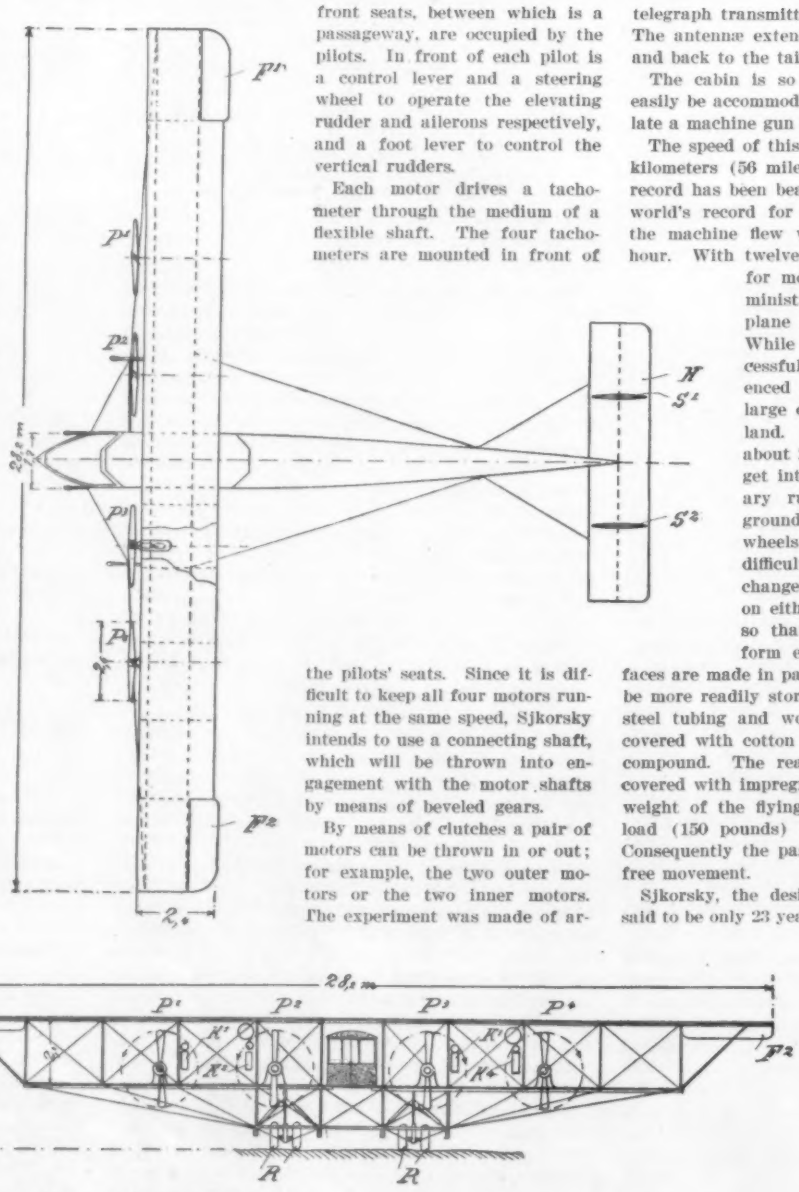
By means of clutches a pair of motors can be thrown in or out; for example, the two outer motors or the two inner motors. The experiment was made of arranging two propellers and two motors behind one another, so that two propellers rotated in front and two behind the supporting surfaces. It was found, however, that by arranging the propellers in a row perpendicular to the line of flight, greater efficiency was obtained. Moreover, the motors are thus more readily cooled. It is said, however, that the motors will be brought nearer the boat body and between each pair accommodations are to be provided for a mechanic who can watch them during flight.

In the after portion of the cabin, a wireless telegraph transmitter and receiver have been installed. The antennæ extend over the main supporting surface and back to the tail.

The cabin is so spacious that several persons can easily be accommodated. It is even possible to manipulate a machine gun and two acetylene searchlights.

The speed of this gigantic flying machine is about 90 kilometers (56 miles) an hour. Nearly every Russian record has been beaten by this machine as well as the world's record for seven passengers. On August 1st the machine flew with seven passengers for over an hour. With twelve passengers the machine has flown for more than 15 minutes. The Russian ministry of war has bought Sjkorsky's biplane and intends to build more like it. While the machine has flown very successfully, some difficulty has been experienced in launching and alighting; for a large open space is required to start and land. Indeed, the machine must cover about 200 meters (656 feet) before it can get into the air. Moreover, the preliminary run must be made on very firm ground. In sand and plowed land the wheels sink too deep. Because of these difficulties the running gear has been changed. Four wheels are now mounted on either side in pairs behind each other, so that the machine has in its present form eight wheels. The supporting surfaces are made in parts so that the entire machine may be more readily stored. The biplane is built chiefly of steel tubing and wood. The supporting surfaces are covered with cotton fabric impregnated with a special compound. The rear portion of the fuselage is also covered with impregnated fabric. Because of the great weight of the flying machine a slight shifting of the load (150 pounds) does not disturb the equilibrium. Consequently the passengers have a certain amount of free movement.

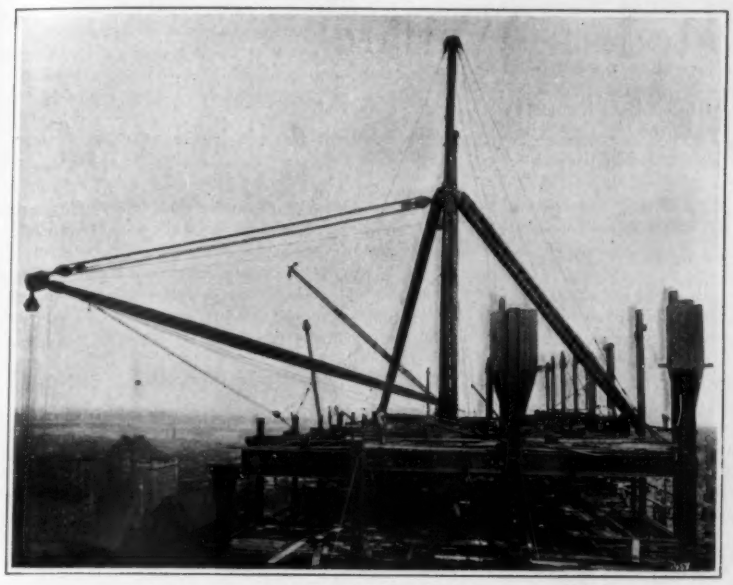
Sjkorsky, the designer of this remarkable craft, is said to be only 23 years of age. His interest in aeronautics was aroused when the aeroplane made its first success in 1908. He started in by designing a headless biplane, and followed this machine up with other aeroplanes of both the monoplane and biplane types. Eventually he went to France where he made a thorough study of French aeroplane practice. Returning to Russia he began building machines again on his own account. He has evolved a small military machine which is now exceedingly well thought of throughout his native country.



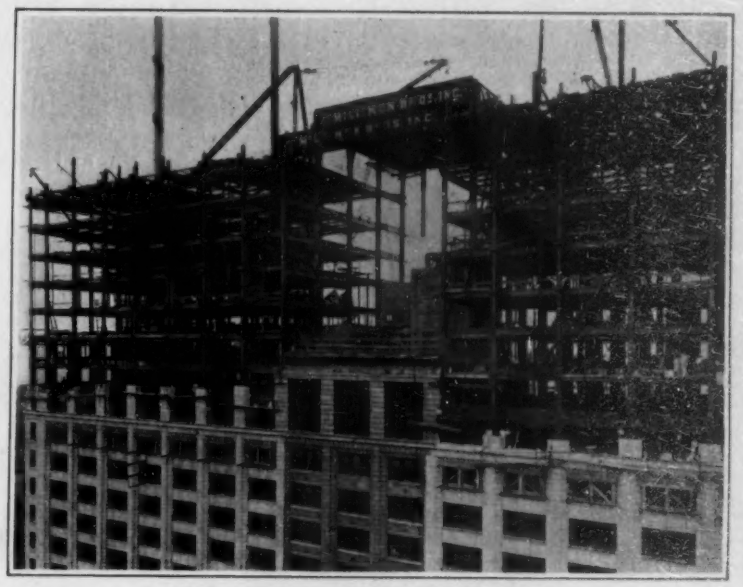
By courtesy of *Zeitschrift f. Flugtechnik u. Motorluftschiffahrt.*

Figs. 1 and 2.—Sjkorsky's biplane. Top plan view and front elevation.

P^1 to P^4, propellers and motors; K^1 to K^4, radiators; R, pneumatic tired wheels; F^1, F^2, ailerons; H, elevating rudder; S^1 and S^2, vertical rudders.



Eighty-ton derrick with which the girders were raised.
Note the gusset plates on the columns that are to support the girders.



Forty-ton girders bridging the old building.
The first hanger in place.

Constructing a Building Upside Down

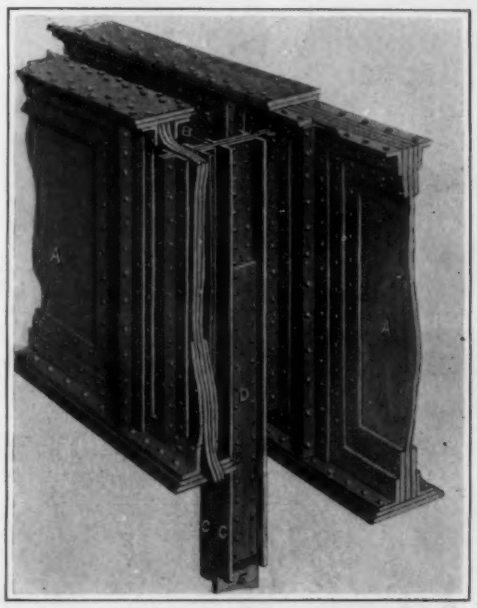
A Seven-story Building Suspended Over a Twelve-story Structure

NEW YORK may boast of some astonishing achievements in structural engineering, but few are more extraordinary than the hanging building of the Consolidated Gas Company. This is a 7-story structure suspended between two 19-story buildings over one of 12 stories that was not originally designed to take any additional load upon its own columns.

The circumstances that led to this odd piece of engineering are interesting. For many years the company had owned an old building on the corner of Fifteenth Street and Irving Place. It had long outgrown the building, and various departments had been housed in neighboring offices. It was decided a few years ago to tear down the old srtucture and build a more commodious one. In order not to disturb the office work during the construction of the new building, the old building was not torn down until after a new 12-story building had been erected on a lot immediately to the east of it. The 12-story building was erected in record time by the engineers of the company. Work started in November, 1910, and in six months' time it was ready for occupancy, after which the old building was torn down.

Before work had commenced on the old site more property had been acquired to the east of the new building, and also to the south of the old building on Irving Place. It was then considered advisable to have all the gas companies of the consolidation in one central building, but this would require more floor space than could be afforded by a 12-story structure over the entire property. Accordingly it was planned to carry the building up to 19 stories. But in the middle of the property was this new 12-story building, whose columns had not been designed to support any additional stories. To be sure the columns of the building could be strengthened, but this would necessitate ripping away the walls built about them, which would seriously interfere with, if it did not actually interrupt the work in the offices. It would be possible to bridge across the building with heavy girders and carry the structure from there up; but these girders would have to be 8 feet deep, which would mean that the rooms on that floor must necessarily take the form of hallways between the girders with small windows near the ceiling. Furthermore, the appearance from the outside would be architecturally bad; the break in the design could not very well be concealed. Accordingly, it was finally decided to carry the bridge across at the very top of the structure and suspend the seven stories from it, the columns of the new 19-story building on each side being made doubly strong to support the additional load. This called for a form of construction that was revolutionary. The building was to be constructed from the top down.

Engineers are accustomed to meet the unexpected, and while this problem was unique, it presented no very serious difficulties. The exterior of the building was designed by H. J. Hardenburg, but the structural work behind it was planned and is now being carried out by the gas company's own staff—Mr. W. Cullen Morris, engineer of construction, assisted by Mr. A. W. Stark and Mr. H. W. Alrich.



Method of attaching the hangers to the girders.

Time-saving method of transporting coke.
Note, in the background, the work of exposing the columns of the old building.

In order that no break might appear in the architectural design where the new building joined the now "old" 12-story building, it was necessary to expose the columns at each side of the old building, and bring the new 19-story columns in contact with the old ones. Thus the pillars at the junction of the old and the new buildings would not be any wider than the other pillars.

Ten extra heavy columns were erected to support the girders spanning the old building and to carry their share of the new construction. The girders are arranged in pairs at the top of the building, where the span is 62 feet. There are six of these long girders. At the rear, where there is a well in the building, the span is only 42 feet, and here single girders are used. The first pair of girders is supported on a lower level than the rest. The front columns are capped with billets, measuring about 4 by 2 feet, and 4 inches thick. These are further supported by gusset plates. Upon these billets the girders rest. The other girders which are supported a story higher are attached to heavy wing plates reinforced with gusset plates.

The larger girders weigh 40 tons, and are 8 feet deep. There is almost 1½ square feet of metal in their cross-sectional area. They were lifted to the top of the building by a large derrick of 80-ton capacity. The enormous boom of this derrick, 72 feet long, may be seen in one of the photographs. It took 23 minutes to hoist a girder from the street 250 feet to the top of the building.

The accompanying drawing shows the method of attaching the hangers to the girders. A pair of girders may be seen at *AA*, both broken away so as to show the construction. Between the girders is a diaphragm *B*, and riveted to this on each side, back to back, are two channel irons *CC*, which constitute the hanger. Two butt plates *D* serve to secure the filler plates *E* to the channels and the diaphragm. In one of the photographs the first hanger may be seen suspended from a girder. It will be observed that the cover plate of the hanger is cut away at intervals in order to lighten the hanger. Unlike the customary columns the hangers are under tension instead of compression, and they do not need a cover plate to prevent them from buckling. The structure is now nearing completion. The stonework has been carried up the face of the building, and there is nothing to show where the new joins the old. None of the weight of the new structure is carried by the old building, except at the rear, where formerly a large water tank was installed. To support this water tank the columns here were made doubly strong, and this extra strength was utilized to carry some of the weight of the new structure.

One of the photographs shows the ingenious method employed for transporting fuel to the boiler plant.

Night Attacks in Modern Warfare

Shells That Illuminate the Enemy

By Major H. Bannerman-Phillips

AMONG the many nerve-trying developments of the art of war in recent times, night operations are likely to assume great prominence for various excellent reasons. To steal a march on an enemy and outmaneuver him; to avoid the unwelcome observation of his aerial scouts, planing at lofty altitudes, securely immune from the fire of terrestrial marksmen; to traverse ground which offers no cover from the view and fire of the enemy in daylight; to carry on an attack commenced before dark and convert it into a successful fight to a finish during the intervening period before the following dawn reveals one's dispositions, and, more important than all, to take the enemy by surprise, and thus enhance the chances of success ten-fold, such are the grounds on which it may be found advisable to act by night rather than by day, although nocturnal operations are by no means so simple as those carried on in daylight and should only be attempted by selected and seasoned troops who have had special and extended training for the express purpose in peace time. They involve a thorough reconnaissance of the ground even in the case of an ordinary night march, and to commit troops to a march or an assault on an enemy's position by night without such a precaution is to risk playing into the hands of the enemy. In the case of a march by night the route ought to be carefully gone over by the reconnoitering officers both by day and night, compass directions taken and landmarks noted, and unless one has actually carried out such a preliminary double reconnaissance and taken part in the subsequent operations it is difficult to appreciate how much depends on the care with which this duty is performed. In the case of an advance across country with a view to attack by surprise it is remarkable how obstacles which can be avoided or negotiated with ease in daylight may become veritable pitfalls by night, bringing confusion among the advancing troops and possibly noise which may reveal their presence and cause the failure of the whole operation.

In all cases secrecy as to previous intentions and concealment of the operation itself are of the utmost importance. By a well-planned strategical night march an enemy may be out-flanked, or a position seized which would have been denied and defended by the adversary if he had realized that the movement was being made or that the attack was coming. A hostile army may thus be placed in such a position that the enemy is obliged to fight under unfavorable conditions, or a commander placed in an embarrassing position by some unforeseen development, may extricate himself by transferring his forces to a distance under cover of the darkness.

A night advance may be used to gain ground from which further progress will be made in daylight, the troops being deployed for attack at the outset and not in march order, and in such cases the attack would usually be made as soon as it is light.

An assault may be actually delivered during darkness, but the hazards of such a proceeding are so great that unless the conditions of a fire fight with the enemy have already proved adverse over the same ground in daylight, or are almost certain to be so, it is usually better to accept the proportion of losses by the enemy's fire which may be expected in a struggle for supremacy under normal conditions by day, trusting to gun and rifle for decision, than to endeavor to gain the point by the bayonet, the grenade, and hand-to-hand fighting, the only methods which can be relied upon in a nocturnal *mêlée*. In cases where a night assault is considered imperative everything is done to avoid alarming the enemy until the attack can close with him. Rifles are not loaded, though magazines are charged and cut-offs closed, the troops are given strict orders not to fire without a distinct order, bayonets alone to be used until daylight makes it possible to aim with effect; absolute silence to be maintained until the moment of assault, the advance to be carried out quietly and without rattling of accouterments. No smoking is permitted, no matches to be struck. If men come across obstacles which cannot be easily crossed or cleared away they must lie down until a passage can be made. If hostile scouts or patrols are encountered an endeavor must be made to capture them without noise, or bayonet them in silence.

When all is said and done it should be extremely difficult, even with all these precautions, to surprise an enemy who in view of the various reasons for night operations will presumably be on the lookout for such methods of attack. Science will be pressed into the service of the defense and the occupants of a position will most certainly endeavor to turn the tables on their assailants, converting night into day at short notice by causing the latter to be exposed to one form or another of artificial light at the supreme moment, while they themselves remain covered by the darkness. Star-shells have been found exceedingly useful against savage enemies, but a better illuminant still is the parachute-light. This is fired from a gun like any other projectile, but of course with only a small charge of powder, and bursting above an enemy, develops into a parachute suspended in mid-air and showing a brilliant light which reveals during several minutes all that is going on beneath.

By courtesy of the *Illustrated London News*.

Searchlights fired by infantrymen. Illuminating grenades disclosing a charge.

An illuminating grenade (Hale's patent) is fired from a rifle. Four of the grenades have just burst in the air and their lights, "held" by parachutes, are falling. The three men in the right foreground have illuminating grenades on their rifles, ready for firing. The rifle is not held at the shoulder, but its butt is rested against the ground; this because the recoil would be rather too much for the man's shoulder.

A civilized and well-equipped force would of course be provided with searchlights of a portable description in addition to the star and parachute shells. These searchlights would be especially useful to enable the artillery to play on the assaulting columns with telling effect, and without them the guns would be of little use in defense by night. They would be posted, under the orders of the artillery commander, well to a flank of the guns for which they are to "make daylight," and protected from the enemy's fire by entrenchments, and would not be turned on until the enemy had been reported as advancing to the attack. As a means of illuminating the immediate neighborhood of a position another form of parachute light, on a minor scale, has been invented. This is in the form of a grenade which can be fired from a rifle, the butt resting on the ground, to ranges of from 50 to 1,000 yards; the floating light burns from 30 to 45 seconds only, according to its size, but the grenade has the great advantage of being very portable, weighing only 14 ounces, the firing-rod used with it weighing another 4½ ounces. It can be used in positions and circumstances where either searchlight or artillery for firing the star or parachute shell would be out of the question.

For the discovery of strategical or tactical night marches it is probable that dirigibles, furnished with electric lights dropped by wire from a considerable height and then switched on and off, will be successfully employed.

Annual Report of the Commissioner of Patents

THE report of the Commissioner of Patents for the fiscal year ending June 30th, 1913, states that during that time there were 67,986 applications for mechanical patents, 1,930 applications for design patents, 172 applications for reissues, 7,053 applications for trade-marks, 926 applications for labels, and 344 applications for prints.

There were 38,754 patents granted, including reissues and designs, and 5,166 trade-marks, 664 labels, and 254 prints were registered.

The number of patents that expired was 21,427. The number of allowed applications which were by operation of law forfeited for non-payment of the final fees was 6,970. The total receipts of the office were $2,082,490.23. The total expenditures amounted to $1,924,459.42, and the net surplus over expenditures was $158,030.81, making the grand total of net surplus of receipts over all expenditures $7,200,103.57.

There was a slight decrease in the volume of business during the last fiscal year, the total number of applications for patents for inventions, for designs, for reissue of patents, registration of trade-marks, registration of labels, and registration of prints, disclaimers to patents, and appeals on the merits, is 80,084. The total of all applications for the fiscal year immediately previous was 81,459 for the same period, which shows a decrease of 1,375 applications received.

In this, his last report as Commissioner of Patents, Mr. Moore again refers to recommendations which have appeared from time to time in his previous reports and which will be heartily indorsed by every inventor and attorney who is at all familiar with the Patent Office and its administration. Once more it is urged that a substantial increase be made in the salaries of the examiners, and once more the need of larger and more commodious quarters for the housing of the Patent Office is pointed out. "The Patent Office has long since outgrown its present quarters, and in its present overcrowded and unsanitary condition is not calculated to inspire or encourage in its employees the best or most efficient work. The desks are too close together in many of the rooms, and the necessity for working under artificial light and among dusty files reduces the average of efficiency among the employees and puts the office at a disadvantage in that respect."

Circular Saws of Paper

PAPER is at present used for all possible purposes in the industries and in all possible forms. It has even been possible by means of compression to give it a degree of hardness comparable with stone, so that it can be used as building material. The latest use for paper however is perhaps the most peculiar. According to a European journal a factory is said to exist in England which is manufacturing circular saws from paper. These paper saws are used for the manufacturing of fine furniture, veneer and other thin plates of wood, which must be treated especially carefully. Some time ago circular saws made from drawing paper were shown in an English exposition. The saws were driven by an electric motor and produced fine boards, which could not have been made better even by the finest steel saw.

The veneers made in this way are so smooth that the cabinet makers can use them without further planing.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

An Encyclopedia on the Card Index Plan

To the Editor of the SCIENTIFIC AMERICAN:

Your article on page 213 of the September 13th number of the SCIENTIFIC AMERICAN, on an encyclopedia on a card index plan, is most interesting.

A couple of years ago the undersigned suggested a similar plan to a couple of American publishing houses, but the time was probably not then right.

It is not too late yet. AKSEL G. S. JOSEPHSON.

Chicago, Ill.

Proposed Method for Clearing Channel or River Bars

To the Editor of the SCIENTIFIC AMERICAN:

The United States of American do not appear to be afraid of ideas because they are new or big or even grotesque. So I am venturous enough to make the following suggestion to you:

Why not, below the bar of a river (which it is desired to clear away or through which a channel is to be cleared or kept clear) place a number of pipes or a network of pipes, perforated as necessary. Then (from the shore or a ship) keep up a constant pressure of water (or air), which would cause a constant pressure at the perforations. I assume this pressure could be made very great.

By this means not only could deposit of material over a determined area or a channel be prevented, but I think the area or channel could be cleared of deposit. The area or channel, once cleared, could be always kept free from deposit.

When an area or channel is to be cleared the pipes or network of pipes might gradually be covered as the work proceeds; when the area or channel is once cleared, the pipes would be stationary.

F. C. CONSTABLE, M.A.

Wick Court, near Bristol, England.

Boiling Volatile Liquids

To the Editor of the SCIENTIFIC AMERICAN:

It may be interesting to note that volatile liquids such as benzine, carbon bisulphide, ether, etc., may be boiled over a naked flame with impunity to danger by simply covering the mouth of the receptacle with a wire gauze. The gauze should be about 20 mesh, and large enough to extend an inch or so over the edge of the receptacle.

The vapors will pass through the gauze and may be lighted (if so desired). The flame will burn above the gauze, but will not pass through it and ignite the bulk-contents. If, for any reason, the flame is to be extinguished, then momentarily cover the gauze with an asbestos board. SPENCER M. GOUDY.

Philadelphia, Pa.

[While the method described above might prove very valuable under certain conditions, it must not be considered absolutely safe. It is always dangerous to handle inflammable volatile liquids in the presence of a naked flame, and if the gauze should be sufficiently heated by the burning vapors above it the flame would pass through to the vapors within the receptacle.—EDITOR.]

Grafting Performed by Nature

To the Editor of the SCIENTIFIC AMERICAN:

I wish to offer correction of a blunder made by one of your correspondents in issue of September 20th, entitled "Grafting Performed by Nature." The photo depicts a very common sight all over the West Indies and tropical America, including extreme southeast Florida. It is the *ficus aurea*, or wild fig, which frequently starts in life as an epidendron upon palmettos, mastics or any other tree upon whose trunk the seed happens to be planted by some passing bird. The seed sprouts, and probably assisted by the bird dung, soon reaches the ground with a root, at the same time throwing out roots in the crevices of the bark of its host, and often surrounding the entire trunk. It is not a parasite like the mistletoe, but feeds from its own root system without sapping the host. JOHN BEACH.

West Palm Beach, Fla.

New Detector for Wireless Telegraphy

To the Editor of the SCIENTIFIC AMERICAN:

Thinking that some of the readers of your magazine would be interested in a new detector device for radio work, I submit herewith the following:

Radio operators are constantly on the alert for new detectors, or some new scheme to improve the efficiency of those in use. The following is a device which the writer has used with success and which embodies both great sensitiveness and ability to withstand heavy static or jarring.

Using the ordinary detector stand, place a piece of molybdenite on the lower contact plate and on this molybdenite place a lump of silicon. A firm contact may now be made on the silicon, and when once adjusted, will not need further attention.

This arrangement serves for long distance work, and in fact appears to have all the sensitiveness of silicon alone, without the usual inconvenience of constant adjustment. No battery is required.

Washington, D. C. JOHN S. DEFOREST.

The Business Side of a Humane Animal Trap

To the Editor of the SCIENTIFIC AMERICAN:

In answer to an article written by George Foster Howell in your September 13th issue, in which he sets forth that there ought to be a humane trap invented to prevent the torture of wild animals, I quite agree with Mr. Howell in his idea of the much needed want in the shape of a humane trap to prevent the torture and cruelty of wild animals that are caught for their furs.

The idea of one spending his money to gain thanks and gratitude from humane people the world over may look quite encouraging to one who is looking for notoriety, but in the matter of dollars and cents it is quite another thing. Inventing a humane trap which would be more expensive than the old steel traps would prohibit the trappers from buying them, unless they were compelled to do so by a national law enacted. Though a humane trap can be invented that would simply detain an animal until he was taken out of it, without any further torture, probably the trapper would nail them to the cross before relieving them from the trap just the same.

It is one thing to say what ought to be done and another thing to do it. Now to invent a humane trap is a very easy matter indeed, but to put it on a stubborn market is quite another question. Now if the Massachusetts Society for the Prevention of Cruelty to Animals or any other body of humane thinkers would put their shoulders to the wheel and see that there is a national law enacted to compel trappers to use a humane trap, I would be one of the first ones to invent and have ready for the market a trap for this purpose.

Glenbeulah, Wis. J. DIEHL.

Flagging at Grade Crossings

To the Editor of the SCIENTIFIC AMERICAN:

In view of the great number of railroad accidents recently, everyone is interested in measures to reduce the loss of life. The other day a well-known artist and his family were killed at a grade crossing protected by a flagman. Apparently the failure of the flagman to properly guard the crossing has not been investigated further than to find out that he carried out his duties properly.

The idea would naturally occur that the means used by flagmen to warn the public were better suited to the former days of slow locomotion than to the rapid rate at which automobiles now travel. It would seem that there is liable to be confusion in the minds of motorists as to the meaning of the white flag, which the flagman waves as a sign to the public that a train is coming.

The white flag is usually understood to mean freedom from danger. Customarily, when a highway is under repair and flagmen are used to control the traffic, the flagman waves a white flag as a signal for the traffic to pass, and a red flag to hold up the traffic. This was the system used on a road near to where the fatal accident occurred. It seems to the writer that the confusion arising from a white flag in one place meaning one thing, and in another place meaning just the opposite, may have been the cause of the fatal accident referred to. At any rate, owing to the prevailing uncertainty, some cautious motorists are in the habit of slowing up before crossings where flagmen are employed, and waiting verbal instructions from the flagman before attempting to cross.

It may be necessary to continue to restrict the use of the flags as signals to the engineer, even though the flagman is stationed at the crossing for the essential purpose of guarding the public. It would seem, however, that the waving of the white flag might be easily discontinued and the red flag reserved only for cases of emergency. Surely, traffic policemen have no trouble in making themselves plainly understood by simple motions of the hand, and it might be that the flagmen could similarly indicate to the public at the crossings whether it was safe to proceed or not. At any rate, some attempt might be made to improve on the antiquated system at present in use by flagmen at railroad crossings, so as to accomplish the purpose of preventing accidents at these crossings. Surely if the system of flagging a train at present in use leads to confusion of the public, instead of becoming a protection, the flagmen might be a menace and accidents continue to occur at crossings which are supposedly protected by flagmen. THEODORE H. LOW.

New Haven, Conn.

The Ten Greatest Inventions

WHICH are the ten greatest patentable inventions of the past twenty-five years? We should like to have your selection.

The vote called for in the SCIENTIFIC AMERICAN of September 27th is coming in from all parts of the country. The principal of the Oley Township High School, Oley, Pa., submitted the list of forty inventions to his scholars and sent in their vote. The Editor wants more such school votes. Scholars will find the question very interesting. Here is the list taken from a dozen essays in the Inventors Prize Contest:

Acetylene gas from carbide.	Kodak.
Aeroplanes.	Liquid air.
Automobile.	Mercury vapor lamp.
Burbank's works.	Monorail.
Calculating machines.	Motion pictures.
Color photography.	Pasteur's work.
Concrete (reinforced).	Phonograph.
Cyanide process.	Photo-engraving.
Dictograph.	Picture telegraphy.
Diesel engine.	Pneumatic tire.
Dirigible.	Producer-gas.
Electric car.	Preservation of sugar-producing plants.
Electric furnace.	Radium.
Electric welding.	Submarine boats.
Fixation of nitrogen.	Transmission and transforming of alternating current
Flexible photo-film.	
High-speed steel.	
Incandescent electric lamp.	Tungsten lamps.
	Turbine (steam).
Induction motor.	Welsbach burner.
Internal combustion engine.	Wireless telegraphy.
	X-ray machine.

One of our readers objects to the list as follows:

To the Contest Editor of the SCIENTIFIC AMERICAN:

Although not a competitor for your "Ten Greatest Inventions" prizes, I have followed the progress of the contest with great interest.

Having been in touch with the development of the industrial arts for a number of years, both as a member of the Examining Corps of the Patent Office and as a practising attorney, I must say I am surprised at the list of "Greatest Inventions" published on page 243 of your issue of September 27th, 1913. Out of the large number of essays which were submitted, many must have been good, and I am at a loss to understand why, in compiling this list, you should have selected as among the twelve best any essay containing items as absurd as some of those mentioned.

One of these items, the "phonograph," was specifically excluded by the terms of the contest as contained in the original announcement. Several of them, as, for example, "Burbank's works" and "Radium," are not patentable inventions, and hence not eligible. Others, such as "Incandescent lamps" and "Internal combustion engines," were in use prior to the twenty-five year period. Still others, as, for example, "Liquid air" and "Monorail," are of purely scientific interest, having substantially no industrial application. And there is no class of apparatus known by the name "Kodak," this word being merely a trade name used to designate the goods of a particular manufacturer.

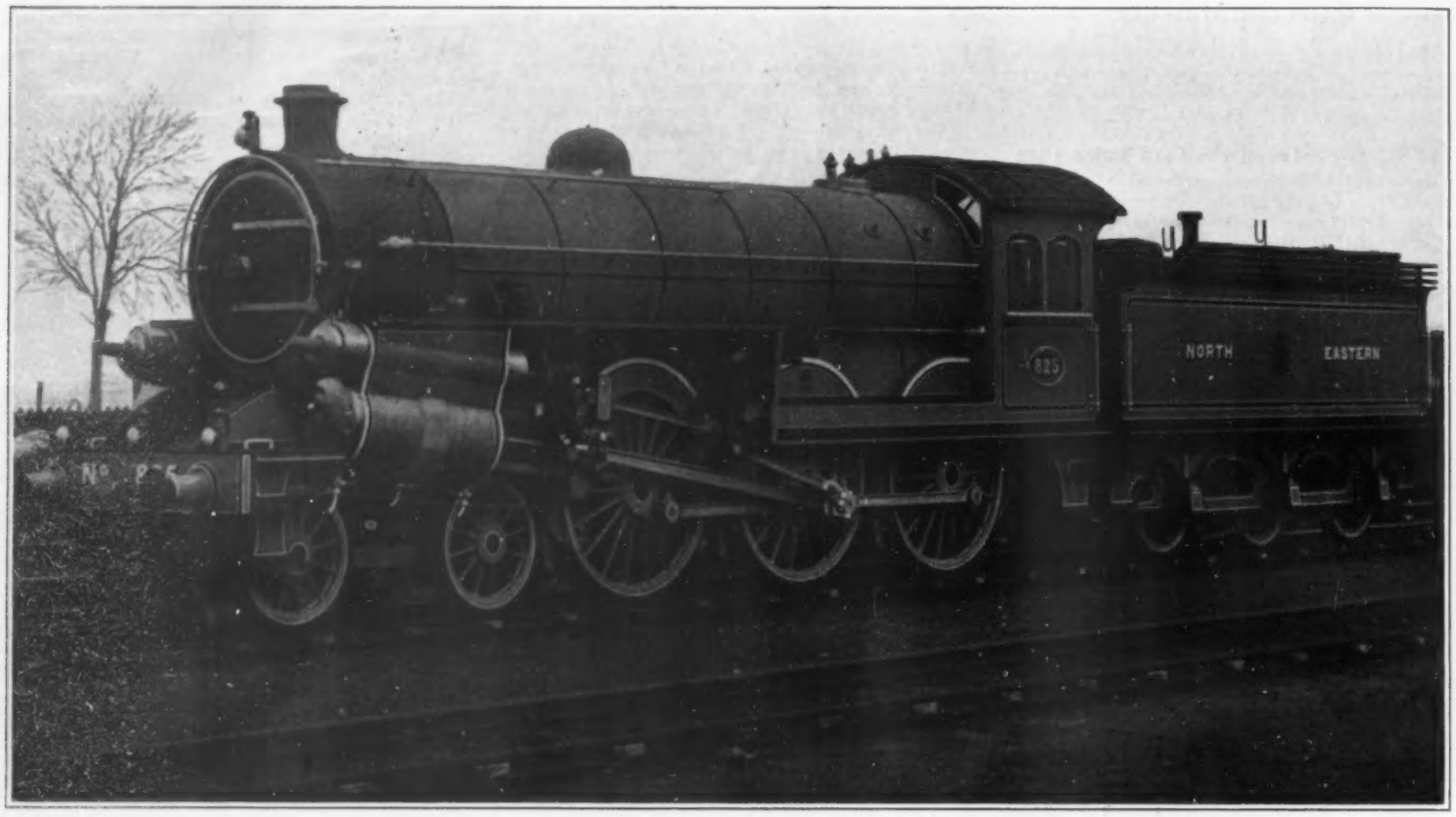
It is inconceivable why you should confuse your readers by including such items as those referred to above, which can be aptly characterized as foolish, while omitting such a thing as the modern type-setting machine. This is universally recognized as one of the most marvelous mechanical inventions of the age, and I happen to know of several contestants who included the linotype in their list, without question.

I suggest for your earnest consideration that you examine again the essays submitted, publish a revised list of items, eliminating all "freaks" and including more real inventions, and *then* ask for the opinion of your readers. This, I believe, would be productive of more satisfactory results. J. HANSON BOYDEN.

Washington, D. C.

Apparently Mr. Boyden has missed the point. The list does not represent all of the essays nor necessarily the best of them. Which are the best is a matter for the Judges and not the Contest Editor to decide. The selection of essays was made to show the wide diversity of opinion on the subject. As explained when the list was first published, *it includes some which quite evidently are not patentable and some that do not properly belong within the 25-year period*, but the voter must decide for himself which should be avoided on that score. Typesetting machines did not happen to be listed in any of the twelve essays, but if in the voter's opinion they are eligible, let him include them and any other inventions of his choice in his list.

Make your own selection of the ten best inventions and send them to the Contest Editor before the 18th of October. The result of the vote will be published in the SCIENTIFIC AMERICAN of November 1st. This number will also contain the essay winning first prize and the announcement of the successful contestants.



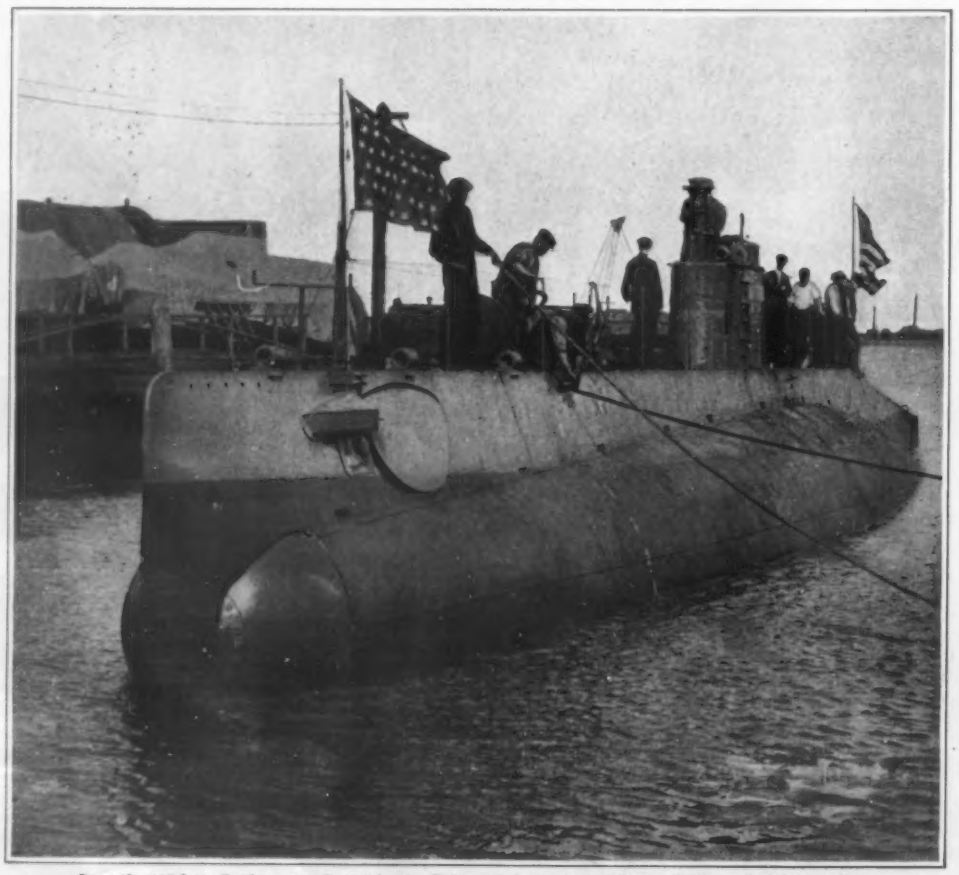
New type of English locomotive.

This locomotive, designed at Charlottenburg, has cylinders of double the length of the stroke, in which the flow of steam is in the same direction within the same cylinder spaces.

Interesting British Locomotive Development

By Our English Correspondent

THE interesting locomotive illustrated has recently been introduced into the heavy express service of the North-Eastern Railway of England, which system, along with those of the Great Northern and North British railways, forms the East Coast Route from London to Scotland. This engine, built at the railway shops at Darlington, has six coupled wheels, and a four-wheeled leading bogie, and it is fitted with the Stumpf "uniflow" or "unaflow" apparatus, according to the designs of Prof. J. Stumpf, of the Technische Hochschule, Charlottenburg. The fundamental feature of the Stumpf engine is the extraction of the energy from the steam without causing the steam to return on its path. The flow is constantly in one direction from the hot inlet ports to the relatively cold outlet ports. In the ordinary steam engine, the flow is, of course, reversed at the end of each expansion stroke and each exhaust stroke. During the exhaust stroke of such engines the clearance space surfaces are cooled down by the cold wet steam, and as a result the next incoming volume of hot live steam suffers considerable initial condensation. In the Stumpf engine this cooling of the clearance surfaces is avoided, with the result that initial condensation is almost entirely absent. Hitherto the avoidance of the initial condensation has been attempted in two different ways, namely, by superheating and by compounding. In the first the steam is heated above its evaporation point to such a degree that the cooling effect of the exhaust steam is not sufficient to lower the temperature of the steam to the condensation point. In compounding, the endeavor is to reduce the range through which the temperature in each cylinder fluctuates. It is claimed for the Stumpf system that it removes the necessity for superheating, and that in a single expansion stage its steam consumption does not exceed that of compound and triple expansion engines. The exact form given to the Stumpf cylinder differs, of course, according to the nature of the engine for which it is intended. In general, however, it is double acting, with an inlet port at each end and a common exhaust port at the center. The exhaust port is constituted by a series of holes drilled round the walls and leading into an exhaust belt formed integrally with the cylinder casting. The piston employed is of exceptional length and fills approximately half of the cylinder volume. In fact, at the end of each stroke one or other of its edges is just clearing the ring of holes and allowing exhaust to take place. It is thus clear that each half of the cylinder volume has to deal with the steam from only one inlet port. It will also be gathered that as the total area of the exhaust port is large the period of exhaust extends from a short time before the end of the stroke is reached until a short time after. The bulk of the one stroke is thus occupied with the admission and expansion, and the bulk of the other with the compression of the steam. The period of exhaust covers one tenth of the stroke each way, so that admission and expansion occupy nine tenths of the stroke in one direction and compression nine tenths of the stroke in the other direction. The North-Eastern engine has cylinders 20-inch diameter and 26-inch stroke. They are about twice as long as cylinders of the same stroke but of the ordinary pattern. The pistons are hollow castings with spring rings at each end. As already stated, they act as exhaust valves and uncover the central ports when 90 per cent of the stroke has been completed. The admission of steam to the cylinders is controlled by piston valves placed on top and actuated by Walschaert's valve gear.



Length, 148 feet. **Surface speed,** 14.5 knots. **Submerged speed,** 10.5 knots. **Radius of action on the surface,** 2,500 miles at 11 knots.

One of the latest submarines built for the United States Navy.

Ocean-going Submarines

IF the development of the submarine in the early years of its existence seemed to be rather slow, no such charge can be made against this interesting craft at the present time. Within a single decade, it has developed from an ingenious curiosity into a potent engine of war, the limit to whose future development no intelligent student of naval affairs would care, just now, definitely to determine.

There is no branch of the naval service regarding which more secrecy is observed than the torpedo service. The official lists of the ships of our navy, as published annually by the department, which formerly contained rather complete information about these boats, now restrict themselves to a mere men-

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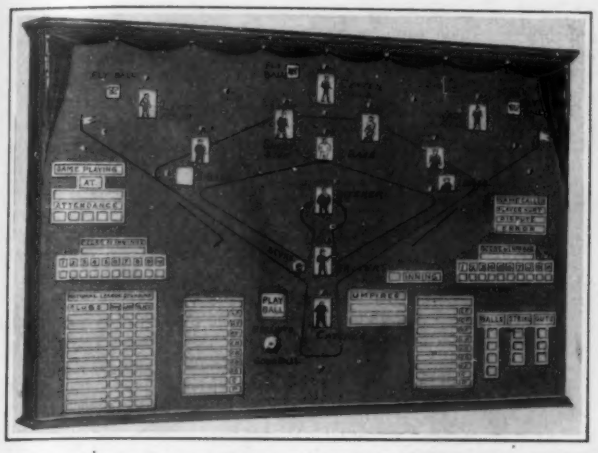


Fig. 1.—An electrically illuminated board that shows the positions of the ball.

Fig. 2.—A pioneer board which reproduces base-running only.

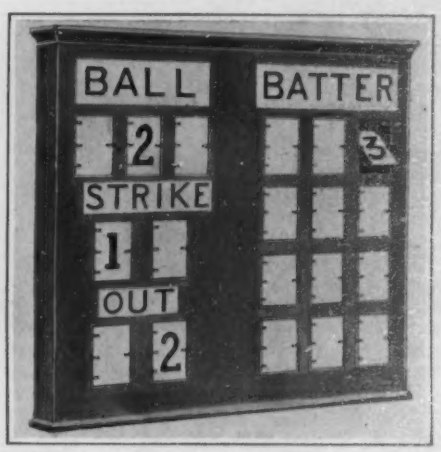


Fig. 3.—A bulletin board which is little more than an annunciator.

Mechanical Baseball Bulletin Boards

Reproducing Hits and Plays in Miniature

UNDOUBTEDLY a sight which must amaze every foreign visitor to America, are the great crowds of baseball enthusiasts clustered around the bulletin boards of important newspapers, watching, enthralled, the posting of the score that indicates the progress of an important game in some distant city. Such is the enterprise of our great dailies, that they are no longer content with gratuitously posting merely the score by innings, but to reproduce on an animated board the actual plays that are made. For nearly twenty years inventors who realized the enormous popularity of baseball and the commercial success that awaited the man who could devise a simple and efficient way of reproducing the events of a distant game, have tried to meet the demands of the newspapers. Only recently, however, has the demand been met. It is the object of this article to show some of the earlier attempts which were made to provide realistic bulletin boards and then to describe the board which has been most successful.

The bulletin board which is shown in Fig. 1 is electrically illuminated and hence is most effective at night. The positions of the players are painted on transparencies. Behind each transparency is a set of two lamps of different colors, one lamp designating the team at the bat, the other the team in the field. As the illustration shows, the bulletin board also announces by electric lights where the game is played, the attendance, the score by innings, the standing of the clubs in the leagues to which they belong, the umpires, etc. Some of the information conveyed by the board is of a transitory character, and other information more or less fixed. Thus the events in the field are necessarily changing constantly, whereas such facts as "Game Playing at New York," "Attendance 22,000," and "National League Standing," etc., are permanent. Therefore the inventor has supplied two sets of keys for his switchboard. One set of keys when depressed remains depressed and is used for conveying the more or less permanent information referred to; the other set of keys is retractile, and is used to indicate the position of the ball at any given moment. As soon as the finger is removed from a retractile key, the light which it controls is extinguished. Electric lights are provided not only behind the transparencies indicating the infield and outfield positions of the players, but also to indicate the location of the ball at every instant of the game's progress. A gong is provided to announce the base hits. When the game is about to commence, the operator at the keyboard lights up the "Score by Innings" transparencies of both clubs, also the places for the runs, the club names and players' titles. As soon as he receives word that the game has commenced, he depresses the key which controls the current to the "play ball" transparency, which is lighted up and remains so until the game is called. When the game is resumed, the key is again depressed. Next the operator operates the key which illuminates the word "Umpires," and when he receives word which of the umpires is to act, he depresses keys which illuminate the umpire's name, in white light. If the umpire should make an error and the name is called, the acting umpire's name is displayed in green lights. At the bottom of the bulletin board at either side of the center will be noted panels bearing the letters "LF," "CF," "RF," etc., which obviously designate the positions of the players. The names of the players are to be flashed opposite the letters which designate their team positions. Two tables of names are required, one for each team. If the club represented at the left center is in the field and the other club at bat, the operator pushes down the key which illuminates the name of the player at bat and the position he holds in the club. As a result a white light is made to flare up. If this man makes an error, the fact is communicated to the spectators by extinguishing the white light and illuminating a green lamp. As the successive players take their places at bat, the keys are operated to illuminate their names in turn and to record their errors.

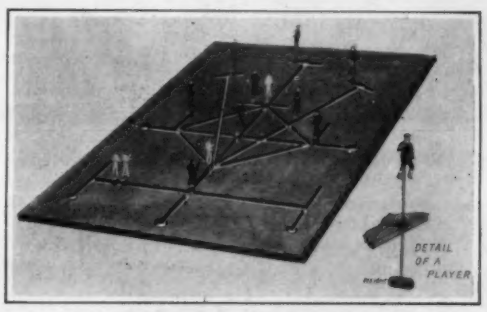


Fig. 4.—A board in which small dummies of the players are used.

The course taken by the ball is indicated by lamps placed in the field. These ball lamps are under the control of the retractile keys. The course of the ball from start to finish is thus accurately indicated and represented. If, for example, the umpire tosses the ball to the pitcher, a lamp right behind the pitcher flares up and goes out as soon as the ball is thrown. If the batter hits the ball, the lamp immediately in front of the batter is illuminated by the depression of the proper key. If the ball should be caught by the catcher, then the catcher's lamp will flare up. Similarly the position of the ball in the hands of the outfielders is indicated, as well as its position when it is batted between two outfielders or infielders. If a player puts out a man trying to make any of the bases or to score, the lamp at the station of the player is lighted and also the lamp at the base where the man was put out in order to indicate what man was put out and what player put him out.

One of the pioneer baseball bulletin boards which is frequently cited against applicants for patents in this class of invention, was patented on May 6th, 1890, by Edwin A. Grozier and Frank P. Anderson. Its general features are shown in Fig. 2. Along the line of the diamond is a groove in which a number of cords or endless belts are arranged to run. These cords and their supports constitute a mechanical conveyer. They pass through the board near one corner of the diamond (near third base in Fig. 2) and are worked by handles behind the board. Each cord carries one or more wire clips extending out through the groove in the face of the board and carrying a tag or marker. The various markers indicate the players. By means of the cords the markers can be moved along from base to base. No attempt is made to show what becomes of the ball if it is batted to one of the outfield positions; only the actions of the base runners is indicated.

The apparatus shown in Fig. 3 does not give nearly so vivid a representation of the actual occurrences on the distant diamond as the devices illustrated in Figs. 1 and 2. Indeed, it is little more than an annunciator. The progress of the game is disclosed by means of plates which swing around on pivots, somewhat like the dampers in a stove-pipe. The numeral 3 in the illustration under the heading "Batter" indicates clearly enough how the plates turn. A simple train of gears driven by a weight, turns the plates. A detent holds the plate in position until the numeral which it bears is to be displayed. The detent is withdrawn by means of an electromagnetic apparatus operated by a key. There are as many keys as there are plates.

In the bulletin board shown in Fig. 4, the actions of the players, rather the positions of the ball, are realistically presented. As our illustration shows, the bulletin board is slotted in various ways, to receive a mannikin. The small detail view shows how a mannikin is held in its slot. The mannikin is carried on the end of a rod which is provided with a friction block or ball at its middle and a counter weight at its lower end. The friction block or ball serves to support the mannikin in the proper position and the weight serves to counterbalance the figure itself. The mannikins representing the players are moved in the slots by an operator beneath the board. Thus "slides," jumps for flyballs, and the like can be reproduced. The most successful device which has thus far been invented is that illustrated

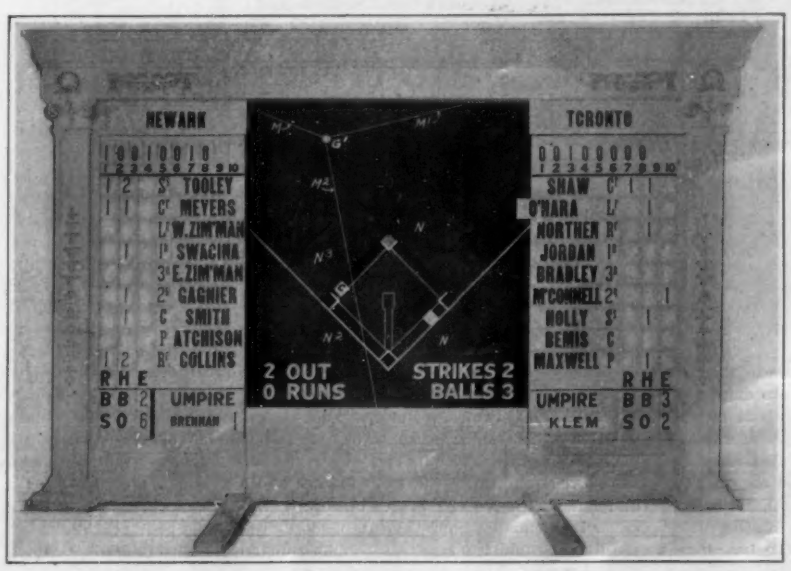


Fig. 5.—Front of the most successful board as it is seen by the spectators.

in Figs. 5, 6, and 7. It is to be found in front of many newspaper offices, all but hypnotizing crowds that keep the police busy. There can be no doubt that it reproduces the events of a distant game with astonishing detail and realism. Indeed, it is not unusual to hear cheers rising from the assembled "fans," when they watch the mimic duplication of a particularly brilliant play on this simple but ingenious bulletin board.

In this particular board the activities of the base runners as well as the career of the ball are represented, and therefore it is a distinct improvement over the inventions previously described.

Fig. 5 is a front view of the board as the spectators see it. In Fig. 6 the covers N, N^1, N^2, and N^3 have been removed to show some of the mechanism. Fig. 7 shows the back of the board.

Between the bases and the home plate grooves are cut. In these grooves four endless chains B travel over sprockets. The sprockets carry player-indicators C, two for every groove except that extending between the home-plate and first base, in which case one player indicator is provided. Only one of the two indicators carried between first and second base, second and third base, and third base and the home plate is visible, the other being concealed by the covering strip N, N^1, or N^2, as the case may be.

The sprockets are driven from a small electric motor A, the current to which can be cut in or out by means of the switch F. The motive power for each chain is also controlled independently from the four keys E. As may be supposed, each key controls one chain and its sprockets. In Fig. 6 a player indicator is shown at the bat. Suppose that he makes a base hit; immediately the proper key E is depressed, and the player indicator travels with its sprocket chain to first base. Suppose that this player tries to steal second base, but is caught between the first and second basemen. The sprocket chain traveling between first and second base is stopped by means of the key E, so that the player indicator remains between the two bases. If a telegraphic report is received that the player has reached second, the chain is started again, so that the indicator is carried to the second base. If, on the other hand, it is reported that the player has been forced back to first base, the operator of the bulletin board turns a handle D, and the sprocket chain carrying the player-indicator is moved back to first. Hand operation is necessary in this case because the electric motor always drives the sprocket chains in the same forward direction.

Two indicators C are carried on the chains between all the bases except the home plate and the first base. It will be observed that an indicator is exhibited to the spectators between bases. As soon as it reaches the base toward which it is moved, the operator presses his key E, stops the chain, so that the indicator remains in sight covering the base. If the indicator is to be advanced to the next base, it is covered by the next indicator, which promptly starts on its journey, the first indicator disappearing behind its covering strip N, N^3, or N^2 as the case may be.

Suppose that all the bases are full. In that situation the players are usually off base. They are held thus by throwing the switch F which cuts off current from the motor A. If a man is caught between bases, the handle D works the indicator backward and forward to indicate his predicament. If he is put out, he is returned to his base and disappears, and his misfortune is recorded on the scoreboard; but if he succeeds in reaching the base, the switch F is thrown again, so that the motor is again supplied with current. Simultaneously the men on the other bases are advanced in position, assuming that none is put out. From this it follows that the switch F is used primarily when all the bases are full.

The mechanism for reproducing the antics of the ball is remarkably flexible. Two white balls are employed. One of these G^1, a real baseball, moves about on the front of the board in full view of the spectators; the other G, moves about at the back of the board. The ball G may be called the master ball, and the ball G^1, in front of the board, the exhibition ball. Each ball is moved about by the aid of three cords meeting at a common point. The cords in front of the board are very thin and so colored as to harmonize with the background. Hence they are not at all visible. The master ball G (Fig. 7) is attached to the cords, J, J^1, and J^2. The exhibition ball G^1 in front of the board is controlled by the cords M, M^1, and M^2. The three cords J, J^1, and J^2 pass respectively over drums K, K^1, and K^2; and the cords M, M^1, and M^2, controlling the ball G^1, pass respectively over the drums L, L^1, and L^2. The two sets of drums are controlled by counterweights.

The master ball G at the back of the board is manipulated by means of the handle H to which it is attached. If the operator is told that the ball has been batted to center field, he simply carriers the master ball G by means of the handle H from the home plate to center field. Simultaneously the exhibition ball G^1 in front of the board is moved by its strings M, M^1, and M^2 in the corresponding direction. Thus every one of the movements of the ball telegraphically reported is duplicated on the board. If the pitcher twirls an outcurve it is a simple matter to show the ball curving out markedly.

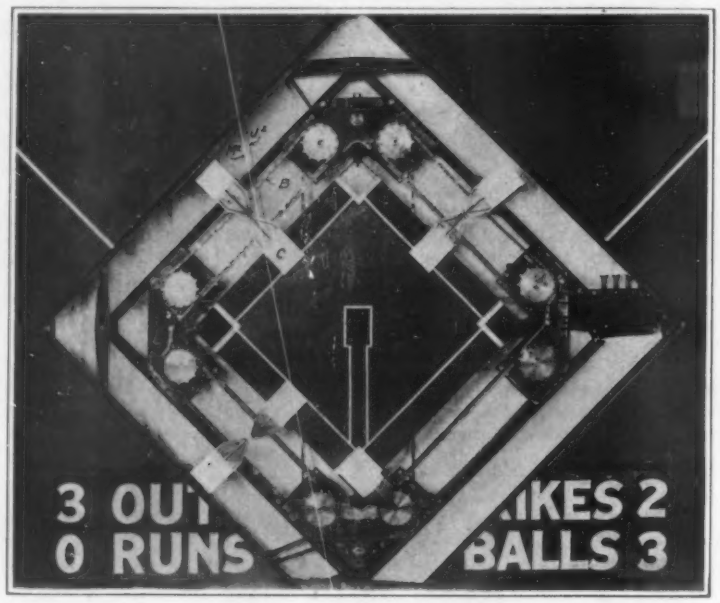


Fig. 6.—Front view of the board with covering strips removed to show the mechanism.

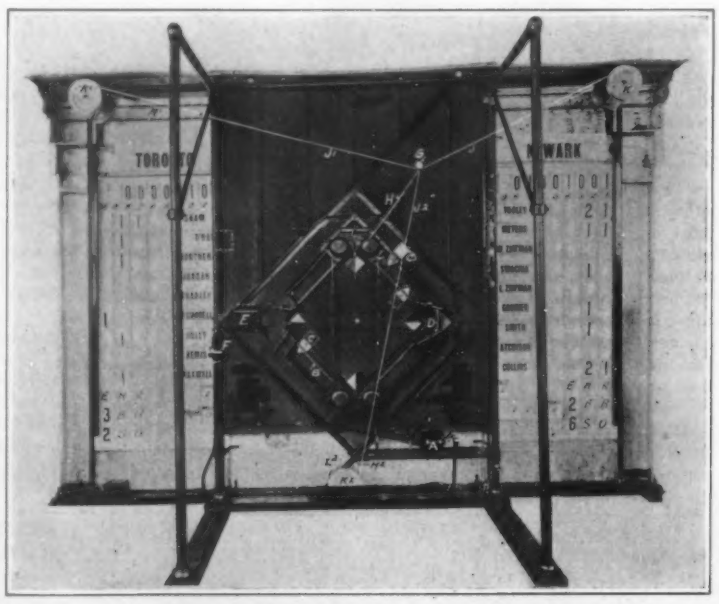


Fig. 7.—The back of the board, showing the method of operating the master ball.

So, too, it is possible to throw the ball with lifelike effect from the catcher to the first baseman or to any position in the field. When the ball is not in operation, the counterweights on the drums drop to their lowermost positions and hold the ball in the pitcher's box.

Rapid Telephotography

By Dr. Robert Grimshaw

RECENTLY Prof. A. Korn, whose work in connection with telephotography, or the transmission of photographs by telegraph, is so well known, and who has solved practically the transmission of illustrations and handwriting over long distances by wire, read a paper in Vienna on improvements made and probable in the line of rapid transmission over long distances; with special reference to the transmission of kinematographic film pictures. The most important problem to solve is increasing the rapidity of transmission. This is limited on the one hand by the inertia of the apparatus used to receive and to transmit; but much more by the capacity of the circuit to transmit the signals or impulses which together make up the picture received.

For sendings through short lines the speed which has hitherto been attained about fifteen minutes for a picture 13 by 18 centimeters (5.12 by 7.09 inches) can be considerably increased, as the sending and receiving apparatus permit this; but the main advantage in phototelegraphy is the ability to beat the post, which comes into play only on long lines such as Berlin to Vienna, Berlin to Paris, etc. This would permit illustrated papers to print in their morning editions pictures which would not have reached them in time by mail. For this reason there would be no use in trying to increase the rapidity of operation of the sending and receiving apparatus, without having first increased the capacity of the line. This is a marked hindrance to the sending of kinematographic pictures, where it is necessary to send a great number of pictures one after another by telegraph in order that they may be assembled at the receiving end in film form.

Working with Herr Bruno Glatzel, Prof. Korn has made the first attempts at transmitting a kinematographic series of pictures; and as a result it appears that where there is an hour at disposal for the transmission of a series of 20 pictures, this can be done.

As the time required for the transmission of a picture 13 by 18 centimeters is 15 minutes, it is evident that where much greater speed is required, one cannot expect too much detail—so Prof. Korn has contented himself with a comparatively simple subject—the gestures of an actor. Four of the pictures immediately following each other were brought together on one plate, and this was sent in 12 minutes; so that for a series of twenty such pictures an hour would be taken up.

The pictures received are then arranged in the proper order of sequence, and transferred to a kinematographic film, which enables their being thrown upon a screen as a kinematographic picture.

This permits giving an occurrence which takes place at midday in Paris, in a Berlin "movie" on the next morning; and when the matter is of importance, so that the entire night can be devoted to its transmission, a good kinematographic representation may be given the next morning.

These experiments also throw light upon the question of whether or not the problem of television or seeing by telegraph can be solved in the near future. A series of twenty kino pictures takes about 20 minutes of actual occurrence, but for the transmission, at least an hour is necessary. To send as fast as the actual occurrence takes place would require 1,200 times the present speed of transmission. For this reason, Prof. Korn gives it as his opinion that telegraphic vision can in the present stage of the art be accomplished only by the use of a great number of electric circuits. The principal hindrance to the accomplishment of this desired end is the enormous amount of capital which would be required.

The Food and Drugs Act Guaranty Label

IN an interesting article published in *The Nation's Business* by the Chamber of Commerce of the United States of America, Dr. Carl L. Alsberg, chief of the United States Bureau of Chemistry, Department of Agriculture, calls attention to the futility of the guaranty label. Many persons misconstrue the significance of the label and believe that the labeled goods have been subjected to analysis by the Department of Agriculture. The Food and Drugs Act does not require the manufacturer to employ the words "Guaranteed Under the Food and Drugs Act," or to place the serial number on his label. The words "Guaranteed Under the Food and Drugs Act" are really a guarantee of the manufacturer to relieve the customer of responsibility should the goods be proceeded against by the Government.

Dr. Alsberg suggests the advisability of legislation providing for the denaturing of domestic food substances which are declared unfit for food and which the shipper may declare designed for use wholly in the arts.

Electrified Chickens—Electricity as a Growth Stimulator

By the English Correspondent of the Scientific American

SOME time ago Mr. H. G. Wells wrote a delightful fantasy called "The Food of the Gods," in which he imagines a food which stimulates growth to such an extent that the dimensions of all living things who feed upon it are increased six or seven times. Mr. Wells probably had no suspicion that such a stimulating agent would ever be discovered. But it appears as the result of some very recent researches, that living beings may be greatly increased in size when subjected to proper conditions. It is true that no mysterious food has been discovered which stimulates growth in this way. The stimulating agent is electricity, to whose powers, both beneficent and harmful, there appears to be no end.

High frequency currents have long been used by the medical profession with benefical results, but until recently the mere fringe of the subject has been touched. Medical men have been contented with a comparatively limited range of application. It has been reserved for Mr. T. Thorne Baker to show what great possibilities are inherent in the application of high frequency currents to living things. For some time Mr. Thorne Baker has investigated the effect of electricity upon the growth of bacteria and mosses, but his latest work, apart from its scientific interest, promises to have results of great commercial importance. The latest experiments are concerned with the influence of high frequency currents upon the growth of chickens, and they are being conducted upon a truly colossal scale. Meeches Farm, Poole, England, is probably the greatest chicken farm in the world, and is the scene of these new experiments. On this farm about four thousand chickens are being grown under the influences of the electric waves. The results are truly astonishing. The chickens live in flats and over the whole building is wound an insulated wire which is traversed by the high frequency currents. The apparatus which generates the high frequency currents presents distinct peculiarities from the electrical point of view, and is the outcome of numerous experiments. Careful adjustments have to be made of the various electrical quantites entering into the circuit, before any effect is produced, but with a proper adjustment of the apparatus, most marked effects occur.

Chickens living in the electrified flats reach, in five weeks, the normal weight of chickens three months old. And out of four hundred chickens treated in this way only six, and those obviously doomed from birth, died. In view of the fact that a fifty per cent death-rate is usual at this period of the year, it will be seen that this result is sufficiently startling. Chickens so weak that they could not stand up, and who in the ordinary course would infallibly have died, have been put in the electrified flats and become healthy and strong.

It is not only that the output of a chicken farm is doubled by this process, but a considerable saving in food is effected. Only two thirds of the usual quantity of food is required by the electrified chickens.

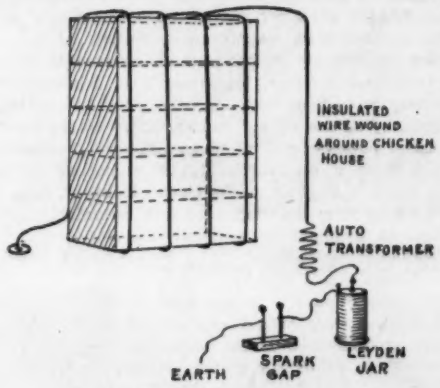
The chickens are charged to such a high potential that a spark discharge occurs on presenting a finger to the beak. From the scientific point of view the most interesting part of this work is the theory which explains *how* high frequency currents stimulate growth in this way. Mr. Thorne Baker is of the opinion that the high frequency currents stimulate the blood circulation by lowering the viscosity of the blood. He has conducted experiments on the effect of high frequency currents on the flow of viscous fluids, and he finds that the time of flow is decreased. The viscous fluid loses some of its viscosity and becomes more mobile.

It is not at present known whether prolonged electric action increases growth up to maturity, or whether its whole effect is to cause the maximum size to be sooner reached.

In certain quarters the application of high frequency currents to the growth of children is being contemplated, and the results in this field will be awaited with interest.

It is evident that we have here a method pregnant with possibilities, and its further developments will be rich in interest both in their scientific and commercial aspects.

The electrified flats in which chickens are raised.



How the chicken house is wired.

A New Language-teaching Phonograph

THE phonograph may be considered, in principle at least, to be an ideal language teacher, but as a matter of fact its use has been very limited for this purpose up to the present time. The reason why the advantages of the phonograph have not been widely made use of, lies in the fact that the spoken words as recorded upon the disks cannot be used alone for learning languages, at least by the general public, for we must not only hear the words, but have the same words in print so that they are visible to the eye, and at the same time have the translation into the learner's tongue. Inventors do not appear to have been able to combine a suitable device for carrying this out, and it remained for a well known phonograph and moving picture firm of Paris to solve the problem, with the instrument seen in our photograph as the result. Although very simple in its idea, the apparatus was by no means an easy one to realize in practice, for what was required was to have a paper strip with the printed words and their translation pass along in front of the learner so that he can see them at the same time he is listening to the same words given out by the phonograph. Then after a little experimental work, a suitable mechanism was devised for carrying this out. The paper band unrolls continuously while the disk revolves, and the right word always falls under the metal pointer placed at the center position. Should the device prove to be all that is claimed for it, it will make a decided step in advance in the matter of learning languages, for the price is within the reach of all, and it will now be possible to learn any language without the aid of a professor such as was heretofore indispensable in order to have a correct pronunciation. The effectiveness of the "automatic professor" lies in the parallel action of spoken and printed word, both eye and ear receiving the impression at the same time, so that the memory retains the form of the printed word accompanied by its sound. In principle there is no limit to the number of languages to be learned by this method. At the start the constructors have brought out disks and rolls for English, German and Spanish, but when the device comes into extensive use these will be followed by others. We need not dwell upon the advantages which the phonograph method has over the usual language professor. Besides being polyglot, it saves much time and is ready to be used on any occasion, without any of the usual drawbacks. The simplest form of the device consists of the phonograph and paper roll mounted upon a flat base for placing on a table. However it is most convenient to have a suitable place for keeping the numerous disks and corresponding rolls, and this can be done in the more elaborate apparatus which is seen here. The outfit for the German language, for French learners, comprises two specially-prepared language books, twenty-six phonograph disks with records upon both faces, and fifty-two printed bands, each corresponding to one face of a disk. It is interesting to note that the first elements of music can be learned in the same way, and a set of disks and other material is already issued for this purpose.

Learning a language in a new way.

A Warning Against Fraudulent Radio-active Water

THE United States Department of Agriculture, through the Bureau of Chemistry, has issued the following warning to the public in regard to the so-called radioactive mineral waters offered for sale in bottles:

"There are indications of the beginning of an attempt to perpetrate a great fraud on the American people through advertising certain mineral waters as possessing radioactivity. These waters, in some cases, are taken from springs the waters of which as they come from the ground do possess certain radioactive properties. Examination of many of these waters by the Department's specialists indicates that whatever radioactivity they possess at the spring is due almost entirely to radium emanation rather than to the presence in the water of any substance possessing radioactivity. These emanations in the form of gas quickly disappear from the water, and as a result, after the water has been bottled a short time, it will possess practically no radioactivity. The belief long held by many people that some mineral waters used at the springs are more effective than when bottled has been explained by some authorities on the ground that the beneficial effect of these waters is due to radioactivity. As the radioactivity disappears soon after the water is taken from the spring, any effect due to the radioactivity must be lost in a short time. If the radioactivity of a water in a spring is 100, four days after bottling it will be only 50 and twelve days after bottling 10. In a month it will be practically nothing compared with the original radioactivity of the water at the spring. The public, therefore, is warned to regard with suspicion any water advertised as possessing radioactivity. As far as the Government's specialists have been able to ascertain, no bottled water, no matter how radioactive it may have been at the spring, retains this radioactivity for any length of time.

"The Department is now investigating a number of the so-called radioactive waters with the object of securing evidence that can be made a basis of prosecution for misbranding. In the past before the Food and Drugs Act was enacted, a number of mineral waters made claim to curative properties which they did not possess and succeeded in creating a misplaced confidence on the part of the consumers. This was particularly true of a number of imported waters which were sold extensively in the United States with a statement on the bottle that they were wonderful or magical cures for all sorts of incurable or chronic ailments. The Treasury Department, acting in co-operation with the Department of Agriculture, now refuses admission to the country of foreign waters labeled so as to mislead consumers as to their real or curative properties. The Department fears that unless the public is warned the fraudulent trade in so-called radioactive waters will develop, just as the fraudulent trade in other mineral waters was developed to the point where people with strong imaginations will supply their bottles with all sorts of testimonials asserting that these supposed radioactive waters have effected wonderful cures."

It is said that 90,000,000 broom handles are used annually in the United States; one for each man, woman and child.

The Construction of a One-kilowatt Closed Core Wireless Transformer

THE advantages of closed core alternating current transformers over the rapidly disappearing spark coil and unreliable vibrator for wireless transmission lie in their comparatively simple construction, their high efficiency, their positive operation and their upstanding under severe overload and physical abuse. Almost all of the disadvantages from a constructional viewpoint are eliminated, so that the making of a very satisfactory transformer involves only patience and ordinary constructive ability.

Fig. 1.—Assembling the "leg" of the core.

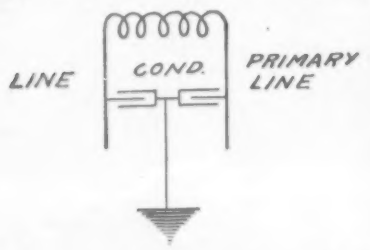


Fig. 2.—Diagram of condenser connection for reducing static strain in primary.

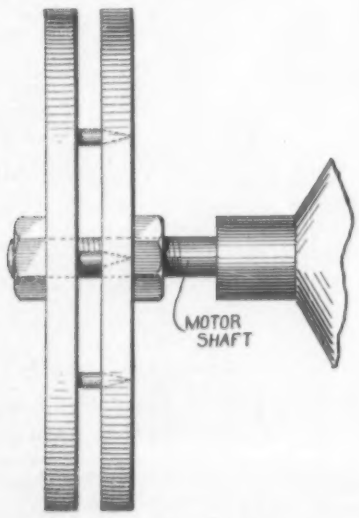


Fig. 3.—View of the winder.

The inefficiency of the average experimenters aerial necessitates the use of a transformer of larger capacity than would ordinarily be needed if all conditions were favorable. Under standard conditions wireless sets will transmit about one mile for every ten watts of energy expended. By standard conditions is meant a well insulated aerial that is at least 100 feet above surrounding metallic or conductive objects. Correlative with this a ground having a low resistance to high frequency currents is necessary. Water and gas pipes contrary to the usual belief do not always fill this requirement, and as the typical amateur's aerial is always more or less poorly insulated and his instruments improperly tuned, his set instead of transmitting one mile per ten watts, seldom averages half of that.

The question of the most suitable size of transformer to build for experimental use, is easily answered. The constructive limit in most cases is reached at the 1 kilowatt size. Difficulties arise from bulkiness and extreme insulation which is necessary in sizes larger than 1 kilowatt. The cost of materials is an important consideration, and it might be well to mention that a 1 kilowatt transformer will cost hardly twice as much for materials as one of the ¼ kilowatt size. If there is any possibility of interfering with commercial or Government stations, a lower power should by all means be used and may be obtained by inserting an adjustable water rheostat or a choke coil in the primary circuit. The former type of current regulator may be easily constructed by filling a keg with strong salt water, placing, for an electrode, an iron disk in the bottom and raising or lowering another iron disk in the solution. The amount of current allowed to flow will be found to be inversely proportional to the distance that the electrodes are apart.

The transformer will consist of the usual hollow rectangular shaped "closed" core of laminated iron wound with a few turns of coarse wire and a large number of turns of very fine wire. Upon the ordinary house lighting current (110 volts, 50 to 120 cycles) being introduced into the coarse winding, or primary, the magnetic action of the core will cause a current of extremely high potential to be originated in the winding of fine wire, due to the ratio of turns. The great difference of potential at the terminals of the secondary, as it is called, is sufficient to cause the current to leap between them and, if they are held near enough together to form an electric arc of low density. By shunting a large capacity condenser across the terminals, a crashing white spark takes the place of the noiseless arc. It is this spark that is used in wireless transmission. A high tension condenser will be discussed in a latter part of the article.

If the transformer is constructed in accordance with the directions given below it need not be oil immersed. However, it is a good plan to immerse the transformer in boiled oil in damp localities, especially near salt water.

Construction.

The core will be built up of annealed, soft iron strips, about No. 28 A. W. G. of two sizes, measuring 14 by 2 and 6 by 2 inches, respectively. Two piles each 4 inches high when compressed, will be necessary of each size. Two "legs" or sides of the longer strips should be built up to a height of 2 inches and in such a manner that 2-inch spaces are left alternately at the ends for the 6-inch by 2-inch cross pieces. This construction is given in Fig. 1 and may be seen fairly well in one of the photographs. About 50 pounds of iron will be necessary for both sides and cross pieces.

The legs when assembled should be tightly taped and wrapped with oiled muslin cloth to within two inches of each end and to a depth of ¼ inch. Oiled muslin cloth, available under the commercial names of Empire cloth and Linonite, when dry will withstand a puncture test of about 1,000 volts per mil, although under heat and corona stresses it will deteriorate somewhat.

There are two well known methods observed in winding transformers. One, by having part primary and secondary wound on each leg; the other by winding the primary on one leg and the secondary on the other. The latter possesses several advantages over the former method from a constructional and economical viewpoint, but it is slightly less efficient. However, as this detriment is more than offset by such essential considerations as simplicity of insulation and design, the latter method of construction will be treated in this article.

The primary will consist of eight pounds of No. 10 D. C. C. copper magnet wire wound on one of the legs to a depth of four layers. A space of ½ inch should be left at both ends of the insulating sleeve so that there will be no danger of the primary's sparking to the core. Consecutive layers should be parafined and insulated by several layers of the oiled muslin cloth as the static kick back from the secondary if a large condenser and aerial are being used, is sufficient to cause "skin" currents upward of 1,000 volts to be generated in the primary. In severe cases of this kind the kick back is sometimes strong enough to cause sparking with subsequent arcing and burn out in the fixtures, thus constituting a serious fire hazard to the building in which the wireless plant is located. To alleviate the strain, a low-capacity, series-type condenser constructed of glass plates, should be shunted across the supply mains and the central conductor grounded to relieve any abnormal difference of potential between the two supply lines or between one line and the ground. This connection is given in Fig. 2.

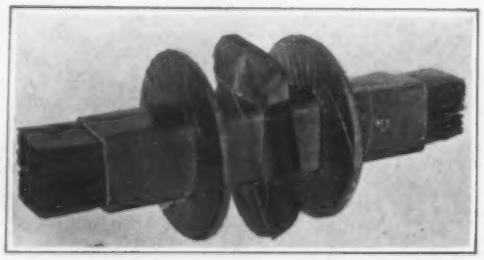


Fig. 4.—Secondary partly assembled.

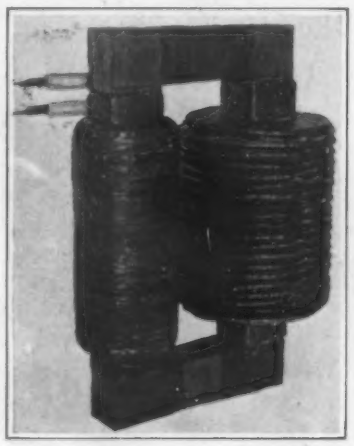


Fig. 5.—The completed transformer.

Fig. 6.—Diagram of the secondary units.

The primary may be taped for appearance and mechanical protection.

The winding of the secondary presents one of the most difficult and trying features in the construction of the whole transformer. Several miles of fine wire must be reeled into thin pancake-like sections—a task somewhat allayed by the proper winding machinery—a lathe preferably.

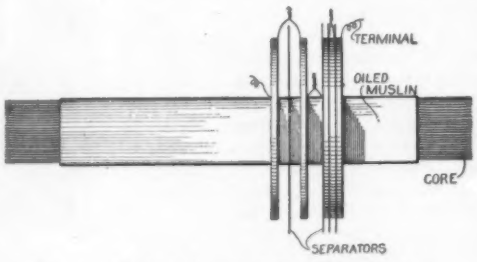


Fig. 7.—Method of assembling the secondary.

The square hole in the center of the section should be sufficiently large to allow it to fit snugly over the core and insulation, about 2¼ inches by 2¼ inches. When a lathe is not available, a simple winder may be constructed similar to the one in Fig. 3. This consists of a fan motor with the section winder bolted to the end of the shaft. The winder or form comprises two disks of ¼ inch maple seven inches in diameter upon the face of one of which are fastened four iron pegs spaced 2¼ inches apart. The wire is wound on over these pegs between the walls of the disks until a section is formed 6 inches in diameter. Twenty sections should be wound in this manner. The size of the wire is No. 32 D. C. C. Nine pounds will be needed.

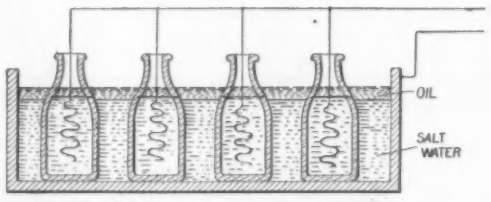


Fig. 8.—Sectional view of the liquid condenser.

The sections upon being wound should be removed to a pan of melted parafin and beeswax for impregnation. The temperature of this compound should never exceed 100 deg. Cent. or it will carbonize and lose its insulating value. The coils should remain in the insulating mixture for at least 15 minutes or until all air bubbles cease rising. They should then be pressed until cold between marble slabs and taped with strips of bias cut oiled muslin cloth, ½ inch wide, particular care being observed that the wires do not become kinked and that their direction is definitely marked when they are taped.

As mentioned previously, there will be 20 sections in all. As the secondary output in volts is about 20,000 a potential difference of 1,000 volts will exist between consecutive sections. Circular, oiled muslin cloth separators 6½ inches in diameter should be placed between the sections as shown in Figs. 7 and 8 to relieve the strain between them.

There are several well known methods employed in connecting the secondary coils. The one, treated herewith, possesses the advantages of a higher efficiency than the others, and the strain between consecutive sections is much less. Both end sections will terminate with an outside turn so that two of the choicest should be set aside for this purpose.

The core leg should be clamped in a vise and a section slipped on to within two inches of the lower end of the insulating sleeve. A separator should then be placed against the section and the inside turn brought under it. Observing the direction that this turn takes, another section should be lowered into position in such a manner that its inside turn runs in the opposite direc-

(Concluded on page 293.)

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel.

GARMENT.—C. N. DUNBAR and J. W. BATCHELLER, JR., care of Sumcote Mfg. Co., Box 519, Kansas City, Mo. This invention relates to garments for use in hunting and for other purposes and more particularly to a so-called shooting coat which comprises a body having one or more individual pockets or loops designed to hold cartridges, and a protective flap normally disposed over the pockets and covering the same.

HEEL BREAST BUFFER.—H. G. BENDIX, 977 A Putnam Ave., Brooklyn, N. Y. Among the objects of the invention is to improve heel breast buffers so that the buffing operation may be performed in a better and more rapid manner than has heretofore been possible and also whereby the danger of damaging the texture or finish of the fine material of which the main portion of the shoe or slipper is constructed may be obviated.

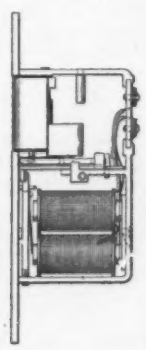
Electrical Devices.

ELECTRODE SUPPORTING ROD FOR ELECTROLYTIC TANKS.—P. JENSEN, care of Leo Goldberger, 146 Smith St., Perth Amboy, N. J. The object here is to so construct the supporting rods for the electrodes that dirt cannot readily lodge thereon, and effective current conducting contacts can be maintained between the suspending hooks of the electrodes and the rods without the necessity of using emery paper or the equivalent to keep the rods in proper condition, as is now necessary.

SHUT-OFF SYSTEM FOR CONDUITS.—ISABELLA GILLEN, 38 N. Pleasant Ave., Rockaway Beach, N. Y. The invention relates to automatically shutting off conduits employed to supply buildings with gas or other fluid agent used for industrial purposes, and it comprises apparatus which is preferably actuated by electricity to operate a valve located in the conduit and close the same when conditions make it desirable that this be done.

TUBULAR INSULATOR.—G. SIMCOE, care of Electric Porcelain Co., Trenton, N. J. This invention relates to insulators or circuit breakers, and has particular reference to devices employed for the purpose of supporting electrical conductors, guy wires, or in other capacities where it is desired to prevent transmission of electric currents.

ELECTRIC LOCK STRIKE.—F. F. SCHNEIDER, R. F. D. No. 48, Ridgefield, Conn. In this case the invention relates to electric lock strikes, and more particularly to keepers or strike plates for door latches, whereby the latch-engaging portion or element of the keeper can be electrically released from a remote point whereby the door is unlocked and allowed to swing open.



ELECTRIC LOCK STRIKE.

Of Interest to Farmers.

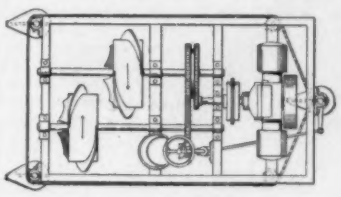
LAND ROLLER.—M. ANDERSON, care of G. A. Eberly, Atty.-at-Law, Stanton, Neb. The machine is drawn along the ground by horses or other appropriate means and disks of one series by rolling upon the ground cause ridges to be formed between them. Teeth of the disks of another series puncture these ridges or provide them with holes to receive moisture absorbed by the ground. The form thus given by the soil also prevents the lighter particles of earth from being blown or washed away.

MILKING APPARATUS.—A. F. STEPHENS, R. F. D. No. 2, Canisteo, N. Y. This apparatus is arranged to milk simultaneously a large number of cows in sets of four, to allow an attendent to readily control the milking for each set of cows, to render the suction action on each cow intermittent, to prevent spilling or waste of milk and to permit of conveniently assembling and disassembling the parts with a view to keep the same clean and to maintain the apparatus in sanitary condition.

LOAD EJECTOR FOR BULL HAY RAKES.—I. M. BARNARD and J. W. LAWLER, Fowler, Colo. In the present patent the object of the inventors is the provision of a simple and comparatively inexpensive load-injector or load-pusher which is for use for bull-rakes, and which also operates efficiently with light draft or traction.

MOTOR PLOW.—J. N. PARKER, Bedford City, Va. In this plow the traction wheels may be coupled to the driving mechanism at will. The power is transmitted equally to all of the traction wheels through a centrally-disposed drive. The shanks carrying the tools are disposed so that the furrows offset to one side of the machine.

MOTOR HARROW.—T. CAMP, 37 Norcross St., Atlanta, Ga. Mr. Camp's invention is an improvement in motor harrows, and his purpose is the provision of a device of the character specified which will thoroughly cut up and pulverize the soil and which will propel itself through the field by the operation of cutting the soil. The accompanying illustration shows a plan view of the improvement.



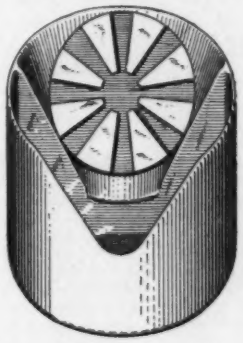
MOTOR HARROW.

Of General Interest.

DEVICE FOR MAKING DESIGNS.—L. L. ALLEN, Box 701, Atlanta, Ga. This device has a bar carrying a marking member, the bar being operated by a rotatable member to which it is articulated, the marking member being adapted to produce a design on a table which is reciprocated as it is rotated, and while the bar with the marking member is operated.

MATRIX DEVICE.—J. A. MAKER, 317 Torry Bldg., Duluth, Minn. This invention relates to matrix devices for use in dentistry, and has reference more particularly to a device of this class which comprises a body, a matrix associated with the same, means for adjusting the matrix, and means for holding the matrix in different adjusted positions.

SANITARY SHAVING MUG.—J. B. RUDOLPH, 373 Ocean Ave., Jersey City, N. J. The invention has reference to an improved form of shaving mug, and an object is to provide a mug so shaped and constructed that water and injurious acids in the soap will readily drain off the soap into a separate water reservoir. The handle in this device is so constructed and positioned that it cannot readily be broken from the body of the mug.



SANITARY SHAVING MUG.

BABY WALKER.—E. S. KINCANNON, 3714 Grand Ave., Spokane, Wash. This baby walker has a body portion so formed as to afford proper abdominal and waist support for the child; and a convenient seat portion is provided in connection with the body part, as well as a head rest and arm rests, so formed and arranged as to promote the comfort of the child.

MEANS FOR CARRYING LIFE LINES.—B. F. MCCREARY, 3 John St., Jamaica, N. Y., N. Y. The inventor's aim is to provide a means for carrying life lines from shore to ship and *vice versa*, or to a high building or other structure and arranged to prevent the projectile carrying the life line from tumbling over during its flight and to cause the projectile to travel a great distance. Mr. McCreary has invented another means for carrying life lines, and the object of the improvement is to provide means for carrying life lines, arranged to insure a proper uncoiling of a very long life line while the projectile is caused to travel a great distance.

FURNACE FOR SMELTING AND REFINING ORES.—W. M. BOWLES and C. O. ALLEN, care of Bowles & Allen, 117 W. Philadelphia St., Schawnee, Okla. By means of this device ores such as those of zinc or lead may be smelted by means of the heat from an electric arc. Further, by its means vapors of the metals may be condensed and may be drawn off. Also, the soluble acid vapors may be gotten rid of.

DOWEL.—T. TISSIER, Buenos Aires, Argentina. This invention relates to dowels for cabinet work and for all other purposes where two wooden portions are to be secured together, and has for its object to provide a dowel by means of which the usual and well known mortise and tenon joint may be dispensed with.

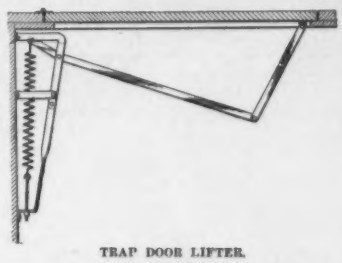
SHAVING SOAP HOLDER.—T. G. MORGAN, care Morgan Sales Co., Shamokin, Pa. The invention provides a device which will take the place of the ordinary shaving stick soap, by providing a handle for the soap, thus making a more satisfactory device for distributing the soap on the face. The handle may be quickly applied to the soap or removed therefrom.

LINE GUIDE FOR COPYISTS.—W. C. SPEDDEN, Colville, Wash. This device comprises a supporting frame having clamping means adapted to engage a book or the like, for holding the supporting frame in position, and a second frame mounted on the supporting frame and carrying adjustably a lateral line-guide arm.

FILM CAMERA.—A. E. HARPER, 607 Bergen St., Newark, N. J., and H. H. RIGGS, Hyde Park, Mass. An object here is to so arrange the exposure opening adjacent the film that when desired only a portion of the film may be exposed. Further, to permit the unwinding of the film from the forward spool without causing sagging or rumpling of the film.

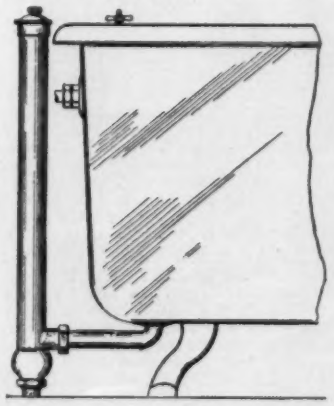
FENCE GATE.—H. G. BEMIS, Riceville, Iowa. The inventor provides a gate having a structural frame, the rails whereof may be shaped from plate or sheet metal to form housings for rolling supports; provides a light supporting structure; and provides supports for the gate, so arranged as to maintain its equilibrium.

TRAP DOOR LIFTER.—F. TROYER, care of C. R. Hichey, Route 4, Nampa, Idaho. A purpose here is to provide an operating means for horizontal gates or doors, such as trap doors for elevators, dumb-waiters or the like, which will render the operation of the door exceedingly easy and which will serve to practically counterbalance the weight of the door throughout its entire path of movement, the effectiveness of the motive means varying substantially in accordance with the variation in the effective weight of the door during its swinging operation.



TRAP DOOR LIFTER.

WASTE AND OVERFLOW FIXTURE.—W. CANTLON, Paris, Ill. The invention provides a waste and overflow fixture having an upper member of a lower bell waste trap connected with the lower member of an upper bell overflow trap, and a stem for raising the upper member of the bell overflow trap, the stem being disposed through an opening in the lower member of the overflow trap, and having a flange disposed below and normally spaced from the lower member of the overflow trap to raise the lower member of the overflow trap and the upper member of the waste trap to which it is connected. The overflow trap opens by an upward movement of the stem, and by a continued upward movement of the stem the waste trap opens.



WASTE AND OVERFLOW FIXTURE.

PENHOLDER OR PENCIL BRACE.—C. A. BEAUJON, Canaan, Conn. The invention refers to stationery and has particular reference to means for use in connection with penholders, pencils or the like, and serving to break up the tiresome and objectionable finger movement that is acquired and used so generally, especially by children beginning to learn to write.

SPECIFIC GRAVITY BALANCE.—B. R. JOLLY, 128 Fayetteville St., Raleigh, N. C. An object here is to provide a device in which certain balancing processes are carried out by means of a thumbscrew which operates a dial so that when a balance is obtained the pointer on the dial will indicate directly the fineness of gold or silver without further calculation.

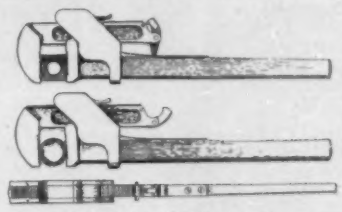
BELT BUCKLE.—T. F. MALONEY, 2721 Surf Ave., Coney Island, N. Y., N. Y. In the present patent the improvement has reference to buckles, and particularly to belt buckles, and the invention has for its object the provision of an improved structure in which a sliding cam action is utilized for clamping the buckle in place.

DISPLAY RACK.—S. BIASATTI, R. F. D. No. 4, Memphis, Tenn. The invention has reference more particularly to display racks for boxes containing merchandise, which merchandise can be easily dispensed when desired from the box without removing the same from the rack structure. This is obtained by providing a display rack comprising box supports adapted to reciprocate in a rack frame.

Hardware and Tools.

WRENCH.—J. J. AESCHLIMANN, 300 Fulton St., Monroe, Wis. The invention relates to means for effecting a quick adjustment of the movable jaw, and involving a pivoted member appurtenant to the movable jaw within the shank of the fixed jaw, normally tending under the action of a spring to interlock with the shank at the interior, and provided with a thumbpiece for disengaging the locking member of the movable jaw, and permitting the latter being adjusted toward or from the fixed jaw.

PIPE AND NUT WRENCH.—HENRY F. HOFFMAN, 138 Simonson Ave., Clifton, S. I., N. Y., N. Y. The object of this invention, No. 1,070,343, is to make the main feature of this recently patented pipe and nut wrench an improvement over other pipe wrenches in durability, strength and quick action in adjusting to and releasing from pipes, and in locking the upper jaw, so as to hold firmly in position when in use on nuts and for employment on side pulls. All sizes of this tool can be operated with one hand. All parts of the wrench are constructed of genuine steel.



PIPE AND NUT WRENCH.

Heating and Lighting.

ILLUMINATED FOUNTAIN.—J. H. REICHART, 1001 Robert St., La Fayette, Ind. This fountain may be readily moved from place to place on the lawn, so that small householders may supply themselves with inexpensive fountains, which may be connected with a garden hose, and with the electric light wires in the house, and which will throw the beam of light upward and into the spray directed upward by the water nozzle.

LIGHTER.—R. FISCHER, 231 Grove St., Brooklyn, N. Y. This invention relates to improvements in lighters or self-igniting devices, and has for an object to provide an improved lighting structure in which a wick will be ignited or lighted upon the removal of the cap from the device.

Household Utilities.

WINDOW SASH LOCK.—H. KRAHE, 833 Van Duzer St., Stapleton, S. I., N. Y., N. Y. The invention provides a lock having a member pivotally mounted on one sash to swing in the path of the other to limit the movement thereof; provides a latch for the pivoted member to hold it in position to interfere with said other sash; provides automatic locking means for said swinging member; and provides a latch for said swinging member, the operation whereof involves three distinct movements and use of both hands.

MOP STICK.—J. J. BEAM, care of Bernard J. Tober, 121 E. Superior St., Duluth, Minn. By means of this stick a mop or brush may be firmly held in any of a variety of positions, wherein the holder may be adjusted to bring the mop into any selected position. The mop may be released or picked up without attaching the same with the hand, and means is provided for spraying a stream of water on the surface being mopped adjacent to the mop.

PUMPING MEANS FOR VACUUM CLEANERS.—C. W. STEWART, 122 N. 3rd St., Olean, N. Y. This cleaner is adapted for the attachment of a hose carrying any approved form of suction nozzle, and the object of the invention is to provide an apparatus in which a bodily rocking movement of the frame provided with a handle, will cause a system of bellows to produce the desired suction at the nozzle.

DOOR SPRING AND CHECK.—I. B. TAFT, Box 525, Cedar Rapids, Iowa. In this patent the spring has a shaft, with means for securing the shaft relatively to a door member, there being a casing mounted for rotating on the shaft, which is connected with the shaft by a coiled spring, which rotates the spring. An arm, pivoted to the shaft, is engaged by a finger secured to the casing, so that the arm will be held yieldingly against a spool, mounted for rotating on a spindle, secured to a door.

SHADE SUPPORT.—A. B. SMITH, Simplicity Shade Adjuster Co., 628 Scimitar Bldg., Memphis, Tenn. This invention provides a support with casing members, each with two

portions disposed at an angle to each other, and each portion having a vertical slot, so that bracket carriers may be concealed behind the casing members and the brackets for supporting the shades secured to the bracket carriers may be disposed through one set of vertical slots, and a transverse member connecting the bracket members may extend through the other set of slots. A cord mounted on pulleys is provided for adjusting and supporting the bracket carriers.

SAD IRON HOLDER.—MARTHA FROST, 945 Whitlock Ave., Bronx, N. Y., N. Y. This invention provides a holder arranged to form a permanent fixture of an ironing board, to permit of conveniently moving the holder into an extended position for supporting the sad iron when using the ironing board, and to allow of moving the holder into a retracted position underneath the ironing board when not in use.

CONVERTIBLE DAVENPORT AND BED.—L. B. JEFFCOTT, 250 W. 15th St., Manhattan, N. Y., N. Y. This bed is arranged to permit convenient and quick changing from a davenport or a couch to a bed or *vice versa*, without requiring much physical exertion, the parts being securely held in either position to prevent accidental changing of the same, and to permit convenient removal of the parts for cleaning and other purposes.

SUPPLY VALVE.—J. J. MEYER, 366 Lenox Ave., Yonkers, N. Y. In order to accomplish the desired result in this patent use is made of a supply pipe having a closed end, a float lever fulcrumed on the closed end and a valve mounted to slide up and down externally on the supply pipe below the float lever connection, the said valve being connected with the float lever.

WRINGER SUPPORT AND FASTENER.—W. F. BANCROFT, Bostwick, Neb. The object here is to provide a support adapted to be clamped by the ordinary clamps of the wringer and having means to hingedly secure one end to a washtub, washing machine or similar support, to permit the wringer to be swung across the washing structure, or swing in line with the support, the movement of the wringer to the latter position serving to take it out of the way or to bring it into a position above a wash boiler or other receptacle.

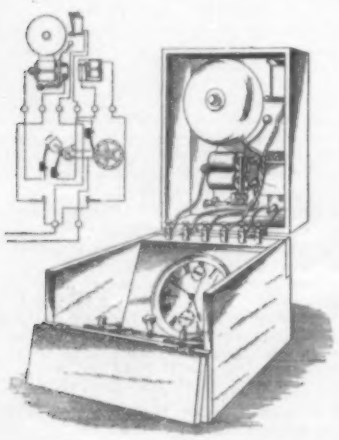
Machines and Mechanical Devices.

FABRIC HOLDER AND EXHIBITOR.—F. A. RAABE, care of G. A. Eberly, Atty.-at-Law, Stanton, Neb. The invention provides a device especially adapted for holding a plurality of rolls of fabric, as for instance silks, cloths, rugs, oilcloths or linoleum, and for retaining the fabrics in rolled condition or for permitting them to be displayed without moving the rolls from place to place, and wherein the rolling and unrolling is done mechanically.

DUMB WAITER.—J. M. BIRCHLER, care of S. A. McNear, 255 S. 12th St., San Jose, Cal. The intention here is to provide mechanism in connection with a dumb waiter, for eliminating the greatest possible amount of friction, reducing wear, and providing for a uniform easy movement in the operation of the same.

PNEUMATICALLY OPERATED PUMP.—E. N. and F. J. WARD, care of G. W. Earnshaw, attorney, Baxter Springs, Kan. The invention relates to pneumatically operated pumps and more particularly to pumps suitable for deep wells. It comprehends a pump having mechanism for enabling the water discharged from the well to control the admission and discharge of air used for lifting the water.

TIMER.—W. F. MINOR, 480 Ninth Ave., Manhattan, N. Y., N. Y. This invention operates a signal at certain spaced intervals. The timing device is adapted to be used in sports and contests where a limited time is allowed



TIMING APPARATUS FOR SPORTS.

for the preparation, and also for the execution or for the contest, the device automatically measuring off these respective times in succession, and thereby obviating any charge that the official of the events may not be fair or correct in his timing.

MEAT CLAMP.—A. H. MATTHEW, Colville, Wash. In the present patent the purpose of the invention is the provision of a novel meat clamp adapted to be employed in connection with a table, for clamping a piece of meat for the proper holding of the same while being cut or trimmed.

VENDING MACHINE.—O. J. HOTALING, 236 W. 10th St., Manhattan, N. Y., N. Y. This invention relates to machines for vending and dispensing newspapers and other like articles, and has reference more particularly to a machine of this class with which suitable coin-operable mechanism for controlling the machine can be employed, and which can be used singly or in combinations of pluralities of units, each consisting of one of the machines.

AUTOMATIC ANCHORING DEVICE FOR SUBMARINE MINES.—G. E. ELIA, Hotel de Crillon, Place de la Concorde, Paris, France. This invention has for its object improvements in automatic anchoring devices for submarine mines which render it possible to insure the normal and secure succession of the several operations of mine laying and also the smooth and easy unwinding of the mooring cable.

MARINE SIGNAL.—RAMÓN F. CORDERO, Rubio, Venezuela. An object here is to provide an indicating means, whereby the steersman or navigator can tell in what direction another boat is approaching or is positioned, irrespective of the condition of the weather; that is, to provide a signaling or danger-indicating device which is actuated below the water line, and is, therefore, not influenced by foggy or stormy weather.

ATTACHMENT FOR DENTAL PLUGGERS.—F. C. LAMBERT, 242 E. Tremont Ave., Bronx, N. Y., N. Y. This invention provides an attachment for dental pluggers and arranged to permit the user to conveniently and quickly place the attachment in position on the plugger whenever it is desired to use a plugging tool standing at an angle to the axis of the plugger.

LOCK FOR HAND BAGS.—J. PARTMANN, 515 E. 156th St., New York, N. Y. As this lock is constructed it is impossible to open the bag except by the operation of the trigger on the handle, which may be covered by the hand used to carry the bag. For this reason pickpockets are unable to open the bag and remove the contents thereof in the manner in which thieves are in the habit of working.

BOTTLE FILLING AND FLUID MEASURING MACHINE.—W. F. ARZINGER, 157 Hancock Ave., Jersey City, N. J. An object here is to provide a machine with a member having a filling chamber with inlet and outlet ports, and valves for commanding the ports, and mounted yieldingly on a valve spindle, so that when the member having the filling chamber, which carries a nozzle, is moved down relatively to the spindle, the inlet port will be closed, and the outlet port will be subsequently opened, to permit the fluid to flow through the nozzle into the bottle.

DEVICE FOR CLEANING PRINTING ROLLERS.—P. J. LYNCH, 5402 8th Ave., Brooklyn, N. Y. This invention refers to devices for cleaning printing rollers, and has for an object to provide a construction which may be applied and removed whenever desired, or applied and left in place for cleaning the rollers of a printing press.

GRINDING WHEEL FOR GRANITE.—P. DUNN, 3 Cox Place, Maspeth, N. Y. This invention provides for feeding the chilled steel shot to the block wheel while the same is rotated; accomplishes the above purpose without scattering the shot or cutting material; provides means for preventing the scattering of the grinding material, and the consequent loss of time; and provides means for securing the iron to a wheel, so that the same does not become loosened.

MOLDING MACHINE.—H. H. HOOSE, 129 N. Main St., Port Chester, N. Y. This invention relates particularly to an improvement in the art wherein the engagement between the roller and the sand container in the flask is a positive one, that is, the pressure brought to bear on the same is not due merely to the weight of the roll; means are provided for turning the roll and moving the flask with the sand therein positively so that the mere frictional engagement between the parts is not relied upon.

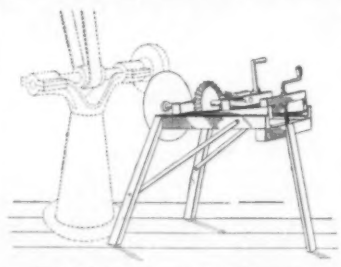
ENVELOP SEALING MACHINE.—F. RUSZKOWSKI, 165 Ave. A, Manhattan, N. Y., N. Y. The invention relates to devices for moistening the gummed edges of envelop flaps and then closing and sealing the same; and it comprises a combination of parts by means of which an envelop after being put in the machine can be moistened and sealed by the movement of a single lever or handle in one direction, this movement serving to actuate all the intermediate mechanism by means of which moistening and sealing are performed.

PROPELLER.—H. S. MORLEY, 119 Cedar St., Newton Center, Mass. This improvement has reference generally to reversible propellers, and the improved construction is characterized by auxiliary blades for use in preventing racing of the engine when the propeller blades are being reversed.

MACHINE FOR THE MANUFACTURE OF BUTTONS.—E. GAUDION, Marolles, France. This invention relates to improvement in machines for the manufacture of buttons turned in corozo, bone and other materials, and particularly to machines or lathes in which the plate to be worked to make a button is held sustained during the work against a non-rotary claw located in front of the rotary cutting tool.

GRAVITY CONCRETE MIXER.—G. W. MILLS and J. E. SIMPSON, Georgetown, Pa. The intention here is to provide a mechanism by means of which the elements necessary for the formation of concrete may be intimately combined in proper proportions by the mere act of passing the materials through the device by gravity.

HOLDER FOR DISKS AND COLTERS FOR USE WHEN THEY ARE BEING SHARPENED.—J. J. HINDS and M. R. WRIGHT, Wall Lake, Iowa. This holder has a frame supported by and movable vertically relatively to the stationary frame, the movable frame having a bearing at one end, in which a vertical shaft is journaled, this shaft having a thread meshing in a threaded orifice in a member se-



HOLDER FOR DISKS AND COLTERS.

cured to the stationary frame. The shaft has flanges disposed so that the movable frame may be raised or lowered relatively to the stationary frame of a crank secured to the shaft. Journaled in bearings in the movable frame is a longitudinally extending shaft, to the outer end of which is secured a disk or colter to be ground, the longitudinal shaft being driven by gearing, which connects a transverse shaft, having a crank, with the longitudinal shaft.

LOADED TRUCK COUNTING APPARATUS.—R. MCGAHEY, Walla Walla, Wash. This invention provides a counting mechanism which is positive in its operation and adapted to be affected only by a truck or similar vehicle when rolled thereover; provides means whereby the counting mechanism with which the apparatus is provided is unaffected by the passage over said apparatus of the person operating the truck; and to simplify and cheapen the construction.

COIN CONTROLLED DIRECTORY HOLDER.—J. A. BALDWIN, 5 West St., Maynard, Mass. The improvement refers to a book holder of that type in which the book is normally held closed, but which can be allowed to open by the pressing of a treadle; and it has particular reference to a holder for a directory, with internal mechanism controlled by the insertion of a coin, so that, before the book can be opened by pressing the treadle, a coin of suitable denomination must be deposited.

Prime Movers and Their Accessories.

ROTARY VALVE.—M. JAEGER, 109 North Terrace, Mount Vernon, N. Y. An object here is the provision of an improved valve structure formed with a head comprising an inner and an outer water-cooled member with a rotating valve sleeve structure interposed, the valve sleeve structure controlling the admission and exhaustion of gases to and from the cylinder through the inner member.

Railways and Their Accessories.

EXTENSION STEP FOR RAILWAY CARS.—ELLEN M. CONDOS, Box 842, Goldfield, Nev. Novel means are here provided for operating a movable step which is so associated with the ordinary steps of a railway car that it may be extended or projected below the latter when required for the convenience of passengers entering or leaving the car.

RAIL TIE.—L. JOHNSON, Marble, Colo. An object here is to provide a tie which forms a positive bond between the two rails, and which prevents spreading of the rails. The invention provides a rail tie constructed largely of metal, but which is provided with a cushion block to absorb the shocks from the impact of the loads coming on the rail.

STATION INDICATOR.—A. MCINNIS, Richmond, Prince Edward Island, Canada. In this patent the object of the invention is to provide a new and improved indicator or guide for use on trains and the like for indicating while the train is moving the name of the next station at which the train is designed to stop.

Pertaining to Recreation.

AMUSEMENT DEVICE.—E. R. ERNST, 449 W. 43rd St., Manhattan, N. Y., N. Y. An object here is to provide a safe and reliable construction which is intended to simulate one or more aeroplanes in motion, but the same being connected to a rotary framework and so formed as to remain upon the ground and rotate upon a turntable around a fixed vertical axis.

WAGON HOUNDS.—R. F. CLIFTON, Mount Airy, N. C. In the present patent the invention is an improvement in wagon hounds, and the inventor has for his object the provision of a simple, economical and light, yet exceedingly strong construction, adapted for use in two-horse or in one-horse wagons.

VEHICLE SUSPENSION.—RAMÓN F. CORDERO, Rubio, Venezuela. An object of this inventor is to dispense with the spring suspension now in common use, and to substitute therefor a suspension depending upon the resiliency of a compressed fluid to take up shocks and vibrations, and to prevent the same from being transmitted to the vehicle body. To attain this object he forms each end of a frame into an inverted U, positioning on the free end of the inverted U a compressed air cylinder, the piston of which is formed into a bearing to support the wheel.

FRONT VEHICLE SUSPENSION.—RAMÓN F. CORDERO, Rubio, Venezuela. This invention relates to a novel form of wheel suspension, and more specifically relates to a combined suspension and shock absorber, particularly adapted to be positioned on the front of a vehicle or in any other place where the traction wheels are mounted for steering.

Pertaining to Vehicles.

VEHICLE WITH CELLULAR PARTITIONS, BOXES, OR DRAWERS WHICH ARE LET SEPARATELY FOR THE CONVEYANCE OF GOODS.—C. ISIDOR, station-master, Rome, Italy. The users may hire the boxes even for a predetermined space of time, and having regard to the route the vehicle makes, they may place in them the goods to be forwarded, whereupon the user himself can shut up the box by means of any secret lock of his own. The consignees, who have been acquainted with the way of opening the secret lock, upon producing the hire ticket bearing the box number, are allowed access to the vehicle to take the goods contained in the hired box.

IGNITER.—G. B. LAMBERT, 527 Fifth Ave., Manhattan, N. Y., N. Y. This invention relates to igniters for the lamps of motor vehicles and for other like purposes, and has reference more particularly to a device which comprises a valve for controlling the supply of fuel to the lamp, a fuel igniting device, and controlling means for the valve and the igniting means.

Designs.

DESIGN FOR A HAMMER HEAD.—P. ANDERSON, Freeport, N. Y. In this ornamental design for a hammer head the implement is a gracefully formed head with claws at the top and claws at the front and near the bottom of the head.

DESIGN FOR A GOBLET.—W. E. HUNTER, Morgantown, W. Va. This ornamental design for a goblet in front elevation shows the body of a drinking vessel of attractive form with its stem resting on a very neat foot or standard.

DESIGN FOR A TOWEL RACK.—A. H. HOWE, 575 Trinity Place, New York, N. Y. In this ornamental design for a towel rack the article has a collar form opened at the front where the two ends are held in position by a screw. Six places are cut in the band to hold rods for hanging towels.

DESIGN FOR CARPET OR RUG.—J. G. PEGEL, care of G. S. Squire, 25 Madison Ave., Thompsonville, Conn. Mr. Pegel has made ornamental designs for three carpets or rugs, Nos. 44,641, 44,642 and 44,643, each of which displays finely executed patterns of borders, fields and centerpieces of highly varied and attractive beauty.

DESIGN FOR CARPET OR RUG.—H. A. HOWE, care of G. S. Squire, 25 Madison Ave., Thompsonville, Conn. In this ornamental design for a rug or carpet midway between the elaborately and gracefully designed border and centerpiece is a very open field through which wind curling stems of small leaves.

DESIGN FOR CARPET OR RUG.—W. E. SAYERS, care of G. S. Squire, 25 Madison Ave., Thompsonville, Conn. In this ornamental design for carpet or rug a charming border surrounds a field and centerpiece of very unique and pleasing invention.

A New Bookbinding Device

TWO big problems that have confronted printers and bookbinders are promised a successful solution in the flexing machine of which Charles W. Mears, advertising manager of the Winton Motor Car Company, Cleveland, is the inventor, patentee and owner.

One of these problems is to secure a flat-opening book that does not involve the expense of sewing, and the other is to produce a book of coated paper that is free from the danger of tearing apart between signatures or sections.

When a sewed book is produced, each separate signature of the book must be separately handled on the sewing machine. This involves an expense of time and money that is so considerable as practically to prohibit the production of sewed magazines. In an effort to produce flat-opening magazines, some publishers have put into practice a method of trimming off the backs and of applying glue to hold the separate sheets together. This is not an inexpensive process, for the machine that does this work requires an investment outlay of thousands of dollars. Then, also, inasmuch as each separate two-page sheet must depend upon a mere shred of glue to hold it in place, there is danger of pages falling out. This danger increases with the age of the book, for glue is an animal matter and rapidly deteriorates.

In the case of the book made of coated paper, even the expensive sewed method is not satisfactory. The reader's eyes fall upon unsightly needle holes and thread in the center of each section, and, if the book is handled considerably, only a short time elapses until the sections tend to separate from each other. The practical impossibility of holding sections firmly together is due to the coating of the paper, which the glue readily detaches. The book then ceases to be a compact unit.

These defects of book-making caused the production of the Mears flexer. This machine is designed to work in unison with folding machines and with presses that deliver folded signatures, thus to avoid the expense of intermediate handling of paper and loss of time. Timed in synchronism with the folder or the press, as the case may be, the flexer receives the folded signature and carries it through the open jaws of a pair of grippers until the closed back of the signature meets an adjustable stop.

The grippers then close on the signature and carry it down over a series of rollers, which bend the signature on a distinct line parallel with the closed back. The return movement of the grippers carries the signature once more over the rollers, bending the signature again in the same place, but in the opposite direction. The grippers then open and the flat signature is discharged into a stacking box, as on the conventional folder.

At the point in the signature where the forward and backward bend is made by carrying the signature over the rollers, the signature sustains a permanent flex. Signatures are gathered in the usual manner and are then made into a permanent book by the cheapest and most substantial method, that of side wire stitching. In the reader's hands a book made on this method lies open flat, the pages falling readily to right or left, as the reader may desire.

The inventor claims for his flexer an entirely new result in book making—a flat-opening, permanently bound book that can be produced more cheaply than by any other process. On a recent run of 40,000 catalogs of four signatures each, the saving in manufacturing cost by this method as against that of sewing was $100.

Various sizes of signatures can be handled on a single flexer, and it is possible to vary the distance of the bend from the closed back of the signature to suit the job. The adjustable stop is regulated by a calibrated device registering in one thousandths of an inch.

Progress in Landing Zeppelins

By Carl Dienstbach

MORE significance than to the loss of the "L. I." under conditions fatal to any aircraft should be attached to recent escapes of Zeppelins from their worst enemy—the danger of being smashed in stormy landings. The military "Z. IV.," returning from the army maneuvers, was prevented by a storm from entering the shed at Leipzig. Torn from the hands of soldiers by a gust, it was violently raised. Two soldiers were killed, but nothing happened to the airship, which, fully manned, with motors running, was instantly under control in the air.

The writer was privileged to see an interesting docking of the passenger ship "Viktoria Luise" with the Grand Duke of Hessen and two princes of Greece aboard in a gusty wind blowing across the entrance of the shed.

Extreme caution was observed and the latest developments in the art of landing were shown. The ship, held by not more than twenty to thirty men, was humored like a restive horse. The men on the ground held it on four bundles of ropes, fore and aft, and by railings, fastened to the sides of each car. Four heavy ropes with clamps to hitch to trucks on the docking tracks, were also manned for instant use. Gusts would alternately raise a car, forcing the men to let go. Running, they caught it again like an enormous football.

Those at the ropes simply slackened with the gusts. Two officers on the ground gave brief commands. The wind would shift so suddenly that the men at the floating rear end had to run, keeping pace with the swinging hull. But even the front car, resting and pivoting on its inflated buffer-bag, was occasionally dragged over the turf. After a heavy gust the roar of the rear motors would be added to the incessant humming of the forward one, and two of the propellers begin revolving. Captain, officers and engineers were at their posts.

Later (the aerial sparring had lasted beyond noon) the steward was seen emerging from the passageway above the front car with some lunch. The ship was first worked toward the shed. The attempt at entering proving too risky, it was taken back to the distant moorings, not to be anchored to the strong chain fastened to a huge "cannon ball" in a heavy socket, nor to four buried blocks by radiating cables, but to reach a water supply.

While it still bobbed in the gusts a long flexible hose was run into the "hold" and the equivalent in water ballast of the passengers' weight was pumped aboard. A rope-lined gangway was lowered, and during a quiet minute the passengers were safely landed, followed by the captain. Relieved of his worst responsibility, he turned the bridge over to the first officer.

During a longer lull the ship was later quickly run into the shed with the help of the propellers.

The military "Z. I.," returning from Silesia, was met by thunderstorms. Contrary to former methods, it sought refuge in the air, weathering heavy winds for eleven hours. Fleeing toward the north it cruised for two hours above Posen, pursued by a chain of thunderstorms that extended to the Baltic. After the storm had subsided in Silesia it pushed through and returned safely to its starting point.

Removing the "Shine" From Woolen Garments

WOOLEN garments, especially hard finished ones such as serges, soon become shiny from wear and the problem is to remove the shine. Some tailors in doing this use a wire brush which operates to pick up a surface resembling nap and sometimes sand paper and fine emery cloth is used in rubbing off the shine. This, of course, requires skillful handling. It is believed that some means may be devised by which an unskilled person may effectually remove the shine from time to time as occasion may require.

The Industrial Need of Technically Trained Men—VIII

The Possibilities of Railroad Engineering

By A. W. Johnston

[Mr. A. W. Johnston, the author of the following article, began his railroad career nearly forty years ago. Educated as an engineer, he was engaged in engineering work about fifteen years, and for the remainder of the time has been an operative and administrative officer. From 1889 to date he has been Division Superintendent, General Superintendent, and General Manager of the New York, Chicago and St. Louis Railroad. Mr. Johnston is a charter member and past president of the American Railway Engineering Association, and a member of the American Society of Civil Engineers. He is a graduate of Massachusetts Institute of Technology.—EDITOR.]

A RAILROAD engineer, as commonly understood, in the earlier history of railroad construction, was primarily the man who spied out the land and determined the location of the line. He was a wanderer over the face of the earth. His training was largely in the school of experience. On his ability as a locator of railways depended very largely the efficiency of subsequent operation. Some of the most distinguished men in the general profession of engineering came into prominence by their ability in locating and constructing railways.

Some railways of the earlier type, once constructed and in operation got comparatively scant attention from an engineering staff. Very often records of surveys and land plans, and all such data, the preservation of which to-day is regarded as imperative, were either not properly compiled, or entirely neglected. In my earlier experience in the engineering department of a prominent railway, I was charged with the duty of a complete resurvey of a line which had been newly acquired, and in the archives of which not a scrap of paper covering surveys or profiles or rights of way could be found.

In the progress of railway development, there has been a gradual evolution. To-day, it may be said there are two general classifications of railroad engineers; engineers of construction and engineers of maintenance. In some instances the engineers of construction are still wanderers over the face of the earth. They are the explorers; they carry the banner of civilization into remote corners, and upon their judgment and skill as engineers, as well as upon their executive capacity as administrators, hinges largely the future efficiency of the routes they open to commerce. In other cases engineers of construction are staff officers of large systems of railways, engaged in directing the opening of branch lines or the improvement of existing lines, or in other instances, directing new "Construction" apart from what is known as "Maintenance."

Engineers of maintenance are usually charged with the duty of conserving the property, which involves a knowledge of track maintenance, and of bridges and structures of all kinds, water service, drainage, signals, and interlocking, and of the multifarious details entering into such subdivision of the work.

The young man contemplating entering the broad field of engineering as a life's work, should have a predilection for the mathematical and mechanical sciences and a determination to pursue with fixed purpose, some one of the several paths along which his predecessors have built up the landmarks of engineering progress.

In dealing abstractly with the two general subdivisions indicated, construction engineering and maintenance engineering, it should be understood that they rest upon the same foundation, or start from the same roots, and the difference in practice is largely a matter of convenience in administration.

The engineer of construction on original railroad location, does have a different view from the man who follows him later as a maintenance engineer, in that he creates the property, and the latter conserves it. Both men have started with same initial equipment as to technical training, and should have the same incentives; loyalty to the profession, desire for advancement and earnestness of purpose. The diversion of paths is very often a matter of opportunity, to be retraced or pursued as the personal talent of the young engineer fits into the solution of the problem ahead. How often it has been said out "at the front" in discussing comparative personal equations, "So and so is a born locator," meaning one who by intuition selects favorable routes. He has a natural aptitude for judging distance, rise and fall of ground, and on a reconnaissance of territory, almost unerringly indicates the most favorable preliminary line. He succeeds as an engineer of construction. His room-mate might never succeed on construction, but might fill with credit, and, perhaps brilliancy, an exacting position on maintenance.

The young man, entering upon the career of a railroad engineer, will ordinarily conclude, after a year or two, that the procession up ahead moves quite slowly. The first eight or ten years of his career must be regarded largely as still preparatory; he is putting some of his technical knowledge into play more or less of the time, and eventually he learns to differentiate between the application of "pure science" to his everyday problems, and the application of principles based on the experience of the profession.

Railroad engineering as practised to-day, calls for the highest form of intelligent interpretation of the scientific method as applied to the most practical of every day problems.

There has been thrust upon the railroad engineers in recent years a grave responsibility for the safe operation of railways. The public, through legislative action, has demanded almost revolutionary practices along certain lines. Rail manufacture, signal installation, electrical operation, are all special problems, calling for the highest type of technical knowledge. Specialization along such lines is inevitable, and the young engineer has a constantly widening field from which to choose.

The railroad engineer is not necessarily limited in his advancement in railroad service, to progress along strictly engineering lines. On many roads the opportunity to take up the so-called transportation problems is not denied him, and many of the railroad officers of important railways were trained as engineers, and as time goes on, there will undoubtedly be an increasing tendency to give such men an equal chance with the man whose sole training has been along so-called practical lines, but the young engineer who would aspire to advancement in transportation work, must not (as was concisely put by a railroad president now deceased, himself an engineer) remain so long a technical engineer as to make him a poor administrative officer. This last suggestion emphasizes the need of differentiation in the mind of the young engineer, between the value to him of exact thinking which comes from the study of the engineering sciences, and the ordinary training received outside of the engineering schools. Pure mathematics may not assist him in systematizing the administrative features of a large construction corps, but it does aid in prompt and sane determination of many of the every-day so-called purely practical problems.

Not all the able engineers were trained in technical schools, but they had to acquire and apply the principles of engineering science by observation and by contact along the slow and oft-times tortuous road we call "experience," so the young man who chooses the field of railroad engineering for his life's work, must get his foundation of the sciences somehow or somewhere, and then patiently and persistently build up his store house of experience. There are many paths in the field before him; opportunity lies along them all. Let him be ready to seize it at the proper moment.

INQUIRY COLUMN

READ THIS COLUMN CAREFULLY. You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. *In every case it is necessary to give the number of the inquiry.* Where manufacturers do not respond promptly the inquiry *may* be repeated.

MUNN & CO., INC.

Inquiry No. 9315. Wanted the name and address of a concern manufacturing novelty ink wells.

Inquiry No. 9316. Wanted the names of manufacturers and manufacturers' agents who make patented articles and other useful devices which appeal to the public and which can be used in a mail order business and by canvassers.

Inquiry No. 9317. Wanted the names and addresses of manufacturers of good selling articles that would appeal to the public where exclusive sale in certain territories can be arranged for; both to sell to the trade and through sub-agents in a house-to-house canvass.

Inquiry No. 9318. Wanted rollers and other appliances for extracting water and moisture from refuse, such as coir dust, with special reference for using it as a fuel.

Inquiry No. 9319. Wanted the name and address of concerns manufacturing novelties in table or pocket cutlery for the wholesale or mail order trade.

Inquiry No. 9320. Wanted an article suitable for large manufacturing—plant equipped for making Boats, Marine Engines, etc. The plant would be capable of making almost any article. A large wood-working establishment is also operated in connection with the metal shops.

Inquiry No. 9321. Want name and address of a firm who could make a machine for turning out rat buttons. The machine must be capable of making the dough of the exact size required, and also a machine to manufacture the tins and a machine for placing the dough in the tins. Preferably this machine should do all of this work in one operation.

Inquiry No. 9324. Wanted—prices including discounts and full particulars of reliable and inexpensive voiturettes or motor cars for export.

Inquiry No. 9325. Wanted the name and address of some stamping concern in New England who could manufacture a window shade bracket, the materials to be used being 14, 16 and 18" gauge.

Inquiry No. 9326. Wanted to communicate with those having inventive ability with a view of acquiring or assisting in developing an invention for mail order use.

Inquiry No. 9327. Wanted to get in touch with a patentee of some article requiring a small amount of capital and selling ability.

Inquiry No. 9328. Wanted, names and addresses of manufacturers of curtain poles and curtain pole brackets or extenders; also manufacturers of window shades.

Inquiry No. 9329. Wanted, names and addresses of patentees of useful household utilities preferably for use in the home laundry or kitchen. This inquirer wishes to correspond with a view of purchasing patents outright.

Inquiry No. 9330. Wanted, some simple article for which there is a good demand which could be manufactured without expensive equipment, or would like an article to push if it is already manufactured.

Inquiry No. 9331. Wanted, a machine for separating the veins of feathers from the shaft of the feather.

Inquiry No. 9332. Wanted, a machine for perforating patterns for transferring on linen.

The Construction of a One-kilowatt Closed Core Wireless Transformer

(*Concluded from page 288.*)

tion to that of the first coil. The wires should be then scraped clean with a sharp knife and the connection made, soldered and taped. Another separator and section should be placed on the leg and the outside turn of the previous section connected to the outside turn of that one. In this manner the twenty secondary units should be assembled, particular care being observed that the turns of each section run in the opposite direction to those of the one preceding it. (See Fig. 6.) The transformer will produce no spark whatsoever if a mistake is made in the connection. Heated parafin should be poured over the completed secondary until all the spaces between sections are completely filled. This materially increases its electrical and mechanical strength.

The end pieces of the core between primary and secondary may be next inserted and the completed transformer will appear as in Fig. 5. It may be mounted in a case or immersed in boiled linseed oil at the option of the builder. If it is oil immersed (in a metal tank) a space of two inches should be left between the windings and the metal sides. With the suitable condensers and average conditions this transformer will transmit signals a distance of 100 miles overland and, at night and over salt water; 200 or more per cent farther.

As the condenser is, next to the transformer, the most important feature of the transmitter and, in the same relation, the most difficult to construct, a few words here concerning it will not be amiss.

There are two distinct types of condenser in use nowadays in wireless telegraph transmission; the leyden jar and the glass plate type. Each has its advantages. The latter is more compact and corona loss is extremely low. The former, if electroplated, within and without, is just as efficient and a puncture is more easily located. The leyden jar coated with tin foil is about the poorest though most frequent selection of amateurs for a condenser. Tin foil blisters and deteriorates under the action of corona or "brush," breakdown is common and the construction is tedious.

The most effective condenser for amateur use and one that has been adopted in a modified form extensively commercially, is the homliest. It has but one disadvantage—bulk. It is practically immune from breakdown and corona is entirely eliminated. It is constructed of milk or beer bottles, certainly an appeal to the purse. For the transformer described herein a condenser as constructed after the specifications given below will be found much more efficient than one of the glass plate type and breakdown or puncture liability is extremely low. The cost will not exceed one dollar.

In a metal tub place sixteen quart milk or beer bottles and at a corresponding level fill them and the tub to within three inches of their tops with a saturated solution of salt and water. Make the connection in the bottles by a coiled copper wire and lead them all to a central conductor. The metal tub will constitute the connection for the other electrode. The water, naturally, adapts itself to the irregularities of the glass surface, hence no air bubbles to invite breakdown will form, and the surface dissipation leakage can be entirely eliminated by pouring on boiled linseed oil until a layer ¼ inch deep is formed over the water.

In conjunction with the 1 kilowatt transformer and condensers, to comply with the new "Wireless Law," a helix of the loose-coupled type must be employed to insure the radiation of a wave free from unnecessary damping. This may consist of a wooden frame, say 14 inches in diameter and 10 inches high, wound with heavy copper wire, as in the case of the old-style helix, but in which a smaller concentric coil of a fixed number of turns of finer wire, is made to slide and thus vary the coupling. A rotating gap

of the series type should be employed for the best results. A high-pitched note having tremendous sending ability can be obtained by proper adjustment.

It is recommended that a license be obtained from the nearest Government radio inspector for erecting a station of this nature before its construction is seriously contemplated as the federal law prohibits the operating of unlicensed apparatus of such high power.

Ocean-going Submarines

(Concluded from page 284.)

tion of their numbers; and in a general way this is true of all the navies of the world. In the mere fact of this reticence is to be found convincing evidence of the great importance which is attached to this branch of warfare.

Derided and belittled in the early days of its struggle for recognition, the submarine at last has come into its own. The principal objections against this type during the early years of experimental work were its lack of speed, its limited steaming power and its restricted radius of action. So great were these limitations that it was considered to be useful merely as an adjunct to the more formidable harbor defenses in the way of long range guns, mortars and submarine mines. That the charge was well founded is proved if we call to mind the limited dimensions and power of our submarines at the commencement of the present decade. The boats of the "Adder" class, of the year 1902, were only 63 feet 4 inches in length, of 120 tons displacement, and of seven to eight knots speed. They carried but one torpedo tube and a very limited supply of gasoline. Four years later the submarines of our navy were still very small craft, their length being 80 feet 6 inches, their displacement 170 tons, and the speed 10 knots on the surface and 8½ submerged. To this class belong the "Cuttlefish," "Viper" and "Tarantula" of 1906.

Between that date and 1909, when the boats of the "Stingray" class were launched, there was a marked development, the displacement increasing to 274 tons, and the horse-power for surface propulsion to 500, as against a surface horsepower of 160 in the "Adder" of 1902. The armament was doubled, these vessels carrying two torpedo tubes.

It was now realized that the submarine was so far developed in efficiency that the time had come to enlarge its size, habitability, cruising radius, sufficiently to enable it to become sea-going, at least to a limited extent. Hence, we find that the boats, of 1911 have an overall length of 148 feet, a displacement of 520 tons, that they can develop 950 horsepower when steaming at the surface, at a maximum speed of 14.5 knots, and that in the submerged condition they have a speed of 10.5 knots. Furthermore, they can travel on the surface for 2,500 miles at a speed of 11 knots, which means that at a slower speed than this and with a full supply of fuel in their tanks at starting, they are capable of steaming across the Atlantic Ocean.

We present an illustration of one of the latest submarines, completed for our navy in the Fore River yards, Quincy, Mass. She is one of what is known as the K class of eight boats. Her dimensions are: Length, 148 feet; diameter, 15 feet. Her radius of action at the surface is 2,500 miles at 11 knots, and she can travel 120 miles submerged at a speed of five knots. Our latest designs carry four torpedo tubes and have a cruising radius of 4,500 miles.

That the submarine will ultimately increase in size, habitability and speed until it is perfectly well able to accompany the battleship at any desired speed on the high seas, is shown by the dimensions which have been cabled from abroad regarding the latest British submarine, which is credited with a submerged speed of 15 knots and a surface speed of 20 knots.

Among the various lines along which naval material is being rapidly developed, we know of none that presents such possibilities or is full of greater promise than this of submarine warfare.

Notes and Queries.

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12861) W. J. C. asks: With the aid of your valuable columns, I would invoke an authoritative statement on a question in physics which is of pivotal importance to the practice of musical harmony. The question is this: Does a vibrating string affect only strings tuned to a similar pitch and its harmonic overtones, or does it also affect strings tuned to certain lower intervals? To me it seems clear that such must be the case, although obviously with less marked effect, as with the lower strings the proportion of moving energy to bulk moved is the reverse of that obtaining with the overtones, hence also the probable cause of the fact having escaped attention. While tuning a square piano the tissue paper in which some new strings were wrapped, gave a rustling sound when I struck the octave of the string with which the tissue paper was in contact. Dr. Riemann has already expounded the theory of downward harmonies, but I am told subsequently relinquished this view, it having aroused skepticism and ridicule, as in "The Place of Science in Music" by H. Saint George. As the question is purely one of physics it is therefore most appropriately answered by those having authority in that domain of science. My belief in the downward harmonies is sustained by the practices of music empirically derived, which can only be logically accounted for by this fact. Moreover, a philosophico-mathematical investigation of this subject has rendered results which, to say the least, are strikingly unique. A. A sympathetic vibration is understood to be in exact accord with the original vibration which caused it. Thus a vibrating string can set another string into vibration if this string is capable of producing the exact tone given by the first string. The number of vibrations of the two strings per second must be the same. A very slight difference will prevent the second string from responding to the first. So too in regard to overtones. It would be expected that only the harmonic overtones common to the two strings could be formed in sympathetic vibrations. The question raised is whether lower harmonics of greater wave length may not be formed by sympathy. If the position stated above is correct it would not seem that any such tones could exist. The question in reality is can a string produce a lower tone in another string than its own fundamental? We do not know any experimental evidence that it can.

(12862) C. S. asks: Kindly settle this debated case: A party contends that the blue flame of a gas cooking apparatus heats better than a red flame. I contend a red flame has greater heating power than the blue flame. I contend that the red color on the apex of the jets on the many-holed spider is the result of an addition of the oxygen to produce luminosity and so aid in producing more caloric, hence greater heating capacity of the gas jets. This is an interesting question to gas stove users. Kindly scientifically diagnose the question. A. You are wrong in your conclusions. A blue flame is much hotter than a luminous flame of any color. This is because all the carbon is consumed in the blue flame. In a luminous flame the light is given out from hot solid particles of carbon. Hold a piece of white paper down over such a flame and remove it quickly. It is smoked by the soot of the flame which the cold paper chilled. This unconsumed carbon, the soot, is in the flame because there is not enough oxygen in contact with it to consume it. In the blue flame the oxygen is mixed with the gas before it reaches the flame, so that the combustion is rapid and complete. The full amount of heat is realized at once, and only colorless gases come away from the flame. You cannot get any soot from a complete blue flame. A red tip on a flame is a sign of incomplete combustion. Such a flame will deposit soot on the dishes placed above it for cooking.

(12863) C. B. F. asks: I have a double convex lens which I am using as a magnifying glass. I find that when I hold the lens exactly 2 inches above the object to be viewed, I can see the object the largest and clearest. Can I fix this lens permanently 2 inches above the object so that everybody can view same, or does the distance of the lens above the object have to be varied for different persons? A. You cannot fix a lens at a specified distance from an object and then have it suit everybody's eye for viewing the object. The distance of the lens must be varied for the eyes of different persons, and for different distances of the eye of the same person, from the object. The proper method of using a lens is to place the lens close against the eye, so that it may be considered a part of the eye, an addition to it. Then move the object to and fro to the position of most distinct vision. The eye is strained by holding a lens at a distance from it and viewing an object through it. This fact one can verify for himself by working with a lens for a considerable time in both ways and comparing the results.

The Chronology of Aviation

THE Scientific American has received from Mr. Hudson Maxim and Mr. William J. Hammer, a limited number of the reprints which they have just issued of the very complete "Chronology of Aviation," originally prepared by these gentlemen for the World Almanac of 1911. The data embrace the essential facts relating to aerial progress. In addition to a short historical *résumé*, one finds herein tables giving altitude records, speed records, quick starting and slow-speed records, passenger carrying, English Channel and other over-water flights, cross-country flights, notable distance and duration flights, etc. There are also statistics relating to accidents and data relative to spherical and dirigible balloons or airships, etc. Of no small interest are the tables giving the most important flights of the Wright brothers. There are doubtless many readers of the Scientific American who are much interested in this subject and who would be glad to secure a copy of this interesting brochure. They can do so by applying to the Aeronautic Editor of the SCIENTIFIC AMERICAN, 361 BROADWAY, NEW YORK

The Ruler of a Kingdom

The man who sits at the steering wheel of his New Chalmers "Six," rules an empire. Here within reach of his arm is a little world all his own. Power, speed, endurance—the forces that make for change and enjoyment—are under the sway of his scepter.

At the touch of his finger the might of sixty horses—eager but restrained—stands ready to do his bidding.

Let's Take a Day Off

Don't you feel like cutting the traces, and getting away to the hills? Let's strike out—what do you say?

Push the switch of the electric starter. There—the engine is running with scarcely a sound. Now the starter has reversed and is recharging the batteries ready for the next time. The silent Entz system does all this automatically. You don't have to give it a thought.

Floating Away Like a Swan

Close your eyes now as we let in the clutch; see if you can tell when we start. This new clutch is a wonder. Its steel discs with their many fingers of cork, grip so firmly, yet so gently, that we move away with the silent grace of the swan.

We're off. Notice how flexible the power—mounting quickly to 20—30—40 or even 50 miles an hour. Now we throttle it down to two, without shifting gears—then away again swift and silent as the eagle's flight.

This wondrous flexibility is in the motor itself. There's no need to resort to cumbersome double gearing.

The Mystery of its Silence

Listen as we speed her up a bit. You hear nothing but the rush of the wind.

We have discarded the noisy little wedge-like cams still generally used. Our big, oval cams lift the valves and slide them shut with velvety smoothness.

So here we are spinning along at fifty miles an hour as quietly as at fifteen. This silence tells you that there is no friction, no wear; that year after year this car will keep on running as quietly and smoothly as it runs today. When you can have such a car, why be content with any other?

An Immense Saving for You

Let's take a look at the motor. A beauty, isn't it? Not a moving part in sight.

The valves are made of Tungsten steel so hard you can cut glass with it. The terrific heat of the cylinders never injures them.

So they never leak nor waste power. They rarely need regrinding.

Tungsten steel valves cost us $80,000 extra per year but they mean an enormous saving to you.

Easy Chair Comfort

Have you noticed that in this car you don't feel the vibration you do in most cars? It runs with a smoothness impossible in any four-cylinder car and very rare among sixes.

Vibration is the chief enemy of durability. The absence of it nearly doubles the life of a car. It doubles the comfort too. You can ride all day long in the New "Six," with the comfort of your easy chair.

A Little Friend in Need

Watch now as I cut down the power until we barely creep along. I am not giving the motor enough gas for the work it is doing. Any motor would ordinarily stall with so little gas. But now I push out the clutch to change gears.

At once, this wonderful motor picks up. The Chalmers-Entz Electric starter does it. It keeps the motor running—won't let it stop. Think what that means in crowded traffic.

Mounting Like Eagles

Now up we go—taking the long mountain grades as easily and quietly as the level stretches. The absence of effort is amazing.

Chalmers Motor Company.
Detroit. Mich.

The power of this master motor seems limitless. Its valves are bigger and open wider than common; they can't obstruct the flow of the gases. All six cylinders draw gas equally from a triple-heated reservoir. So even with low grades of gasoline, every atom is turned into power. Think of the saving in a season's fuel bills.

On Top of the World

Two hours away and here's a new world spread at your feet. Let us take a look at the car that made it possible.

Look at the graceful lines of the bell-shaped body—roomy and comfortable. See the graceful, molded oval fenders.

Tires are carried in the rear, leaving the running board clear. Gas tank in the rear too. It holds 22 gallons.

Of course, you've noticed that the driver sits on the left. Control levers are in the center, leaving plenty of room to enter from either side.

A Home Run

Luncheon over—and we're off again for home. See how gently our big brakes ease us down the steep grades; how our long underslung springs and deep upholstery cradle us over the bumps. See the landscape flying backward like a scudding cloud.

Surely in all the world there's no car like this. It gives a luxury of motion you've never dreamed of; a world of enjoyment in motoring you have never known.

Put This Car To the Test

Go ride in the New "Six." Let our dealer take you out on our Standard Road Test. It is our way of proving to you that this car will do things that no other car will do.

Roadster	**$2175**	**Six Passenger**	**$2275**
Four Passenger	**2175**	**Coupe**	**2850**
Five Passenger	**2175**	**Limousine**	**3600**

All bodies interchangeable. Wire wheels, $80 extra (five)

Fully equipped f. o. b. Detroit

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Send me literature explaining why the New Chalmers "Six" is the Master Motor of them all.

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